THE TELEGRAPHIC JOURNAL AND

Electrical Review.

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ELECTRIC LIGHTING IN THE CITY OF LONDON.

The experiment of lighting parts of the City by means of electricity has apparently been so successful that the Commissioners of Sewers have issued notices to the effect that they desire tenders for a considerable extension of this system of illumination. In fact, the districts or sections to be experimentally lighted from sunset to sunrise for a period of twelve months now amount to six, including that portion recently abandoned by Messrs. Siemens Bros. The streets to be illuminated by the electric light, and for which tenders are required, are as follows, and they are divided into four districts:—

London Bridge.
Queen-street (between Queen Victoria-street and Cheapside).
Cheapside (between King-street and Poultry).
King-street.
Guildhall-yard.
Poultry.
Mansion House-street.
Royal Exchange (open space in front of).
King William-street.
Adelaide-place.
Lombard-street.
Fenchurch-street.
Aldgate.
Aldgate High-street.
Leadenhall-street.
Cornhill.
Bishopsgate-street (between Cornhill and Liverpool-street).
Liverpool-street (between Bishopsgate-street and New Broad-street).
New Broad-street.
Old Broad-street.
Threadneedle-street (between Old Broad-street and the front of the Royal Exchange).
St. Martin's-le-Grand.
Aldersgate-street.
Long-lane (between Aldersgate-street and Smithfield).
Smithfield, East side (between Long-lane and Giltspur-street)
Giltspur-street.
Newgate-street.

It is probable, and we hope such will be the case, that several systems of great promise will here have an opportunity of proving on a large scale the value which has been set upon them for smaller installations. The Pilsen and Gérard arc lamps appear to be admirably adapted for competing favourably with those already in operation, and it may be that in certain streets the incandescent or semi-incandescent systems will be introduced. It is also to be desired that Messrs. Siemens may again see their way to bring about another installation of their very complete and effective arrangements for lighting our streets, for their abandonment of the district allotted to them during the last twelve months is a theme of general regret. We should also welcome the appearance of the Jablochkoff candles in one or other of these sections, for although this system of electric lighting is scarcely ever alluded to at the present time, it has proved itself one of the most valuable and reliable methods we have yet seen, and with more simplicity in the arrangements of conducting wires and for commutating the candles, might hold its own against its later rivals. It was an unfortunate circumstance that the Electric and Magnetic Company, formed some two years ago for the express purpose of working the Jablochkoff system, should have fallen through. However, this method, even as it stands, is less liable to accident than any other with which we are acquainted. A break down of engine and dynamo-electric machine is a matter common to all methods, and will, of course, cause the extinction of all lights (in the absence of accumulators), but any accident to the external circuits affects the competing systems in different ways, and the Jablochkoff, in our opinion, least of all. Again, one of the most important matters in connection with the present methods of electric lighting is the arrangement of the carbons. The arc lamps of Brush, Weston, and Siemens have double pairs of carbons, lasting say, sixteen hours or so. This involves, of course, a certain amount of complication when compared with lamps having single pairs of carbons, and to increase the effective time of burning to twenty-four or thirty-six hours would necessarily mean less simplicity still. The candle system as exemplified in the Jablochkoff apparatus is free from such defects, and could be effectively employed for long intervals of lighting in a more certain and simple way than any of the rest, and the attention required for replacing the consumed carbons need be but very slight and occupy but a short time.

In regard to the expense of electric lighting in the three districts allotted to Siemens, Brush, and the Electric Light and Power Generator Company during the past year, it appears that the total of the three, as compared with the total gas in the same districts, is as about 2 to 1, the cost of works for the electric light not being taken into account. This result is certainly favourable for the future prospects of the electric light, and with double the area to work upon the accounts for the next twelve months' experiments may be expected to correspond still more closely with the cost of gas. We are of course presuming that the figures of the various electric lighting companies are correct statements, but in any case, as the area upon which electricity as an illuminating agent may be employed is enlarged, it must become more and more a successful rival of gas. The extension of the field of electric lighting, which should commence on the 1st of October next, will probably give us a true idea of the value of electricity for such purposes. The competing companies will be fully acquainted with the failures of their predecessors, and can take the necessary precautions for their prevention accordingly. The one risk to which we earnestly call the attention of all electric light engineers is that of indifferent insulation on their conductors. They will see, from the City Engineer's Report, that many interruptions took place in the lighting during the past experiments, and the more serious of these were all due to faulty cables. It is only necessary to reflect for a moment on the system of underground wires in connection with the postal telegraphs, in order to understand this. Here the greatest precautions are taken to insure good insulation, both by the manufacturers of the insulated wires and by the Post Office engineers. Tests to show the state of the circuits are continually taken, and it may be easily seen by the following remarks that quite as much, if not more, care is required for electric lighting purposes. If a small defect exists in an underground telegraph circuit, this fault will in course of time develop itself to the extent of rendering the proper working of the instruments impossible, and this by the use of a current not exceeding a potential of say 50 volts. Now imagine what comparatively perfect insulation is required for an electric light circuit employing a current with a potential of say 800 or 1,000 volts, and how carefully such wires should be tested by the proper insulation tests before they are placed in position. No Post Office wire would be accepted for under-

ground telegraphs which did not give a certain specified insulation resistance per mile, and the same rules must eventually be applied to any wires employed for the purposes to which we are referring. We made a special article of this subject in our last issue, and we shall be pleased to give our advice and experience to any one desirous of such assistance.

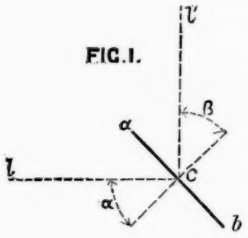
ON PHOTOMETERS.

III.

PHOTOMETER IN WHICH THE LIGHTS ARE WEAKENED BY OBLIQUE INCIDENCE.

*Bothe's Tangent Photometer.**—Bothe's photometer differs from Bunsen's only in the equality in the illumination of the paper screen with its wax-spot being obtained by varying the angles of incidence of the two lights, instead of allowing it to fall perpendicularly upon the screen. The inventor of this modification assumes that the intensity of the illumination of the paper surface is proportional to the cosine of the angle which the direction of the incident light makes with a perpendicular, raised from the paper surface.

FIG. 1.



Suppose, for example, the lights, l and l^1, fig. 1, are so placed that the rays cross each other at a right angle in the point, c, at which is placed a paper screen, a, b, with wax-spot so arranged as to be turnable about a centre, c. If the lights, l and $l,^1$ are equal and equidistant from c, the angle at which the screen, $a\,b$, must be placed, in order that the wax-spot disappears, will be 45° to the direction of the rays of each light source.

But suppose l^1 to be more luminous than l, the screen will have to be so turned that the light rays from l^1 fall upon it more obliquely than those from l, in order to obtain the same amount of illumination on both sides of the screen. The light rays of the two sources, l and l^1, falling at right angles to each other upon the screen—

$$\beta = 90° - \alpha, \text{ therefore } \cos.\ \alpha = \sin \beta;$$

and if the illuminating effect is proportional to the cosines of the angles, α and β, the relation of the two lights will be—

$$\frac{l}{l^1} = \frac{\cos.\ \alpha}{\cos.\ \beta} = \frac{\sin \beta}{\cos.\ \beta} = \tan \beta.$$

We have had no practical experience with this photometer, and cannot, therefore, guarantee its correctness. Indeed we should be rather disposed to doubt whether the inventor has not assumed a general law of reflection which is not strictly applicable to surfaces which disperse whilst reflecting the light. It has been shown by Bouguer † conclusively that the law of reflection is not the same for all surfaces. For example, with one kind of paper, at an angle of 45°, the illumination was only about $\frac{3}{4}$, and for plaster of Paris at the same angle, only about $\frac{1}{4}$ths of the value which would correspond with the general law of reflection. At an angle of 30° experiments gave for paper only $\frac{7}{8}$ and for plaster of Paris only $\frac{3}{4}$ths of their theoretical value. The suggestion of employing oblique incidence instead of distance to obtain equality is not without interest; because not only is it often inconvenient to obtain the requisite distance in dealing with strong (such as electric) lights, but in damp and foggy weather, a not inconsiderable quantity of light may be absorbed by the atmosphere.

* "Pogg. Ann.," cxxviii., p. 628.
† Bouguer's "Traité d'Optique," p. 161.

PHOTOMETERS IN WHICH THE LIGHTS TO BE COMPARED ARE REDUCED TO A CONSTANT VALUE BY ABSORPTION.

Light falling upon any object is expended in three ways—(1) in reflection from the surface; (2) in absorption; and (3) in what gets through to the other side of the object. It is in the different relations which these three items stand to each other that different substances behave in regard to light. Opaque bodies do not allow any light to pass through them; therefore item No. 3 falls out of consideration, and the light which reaches an opaque body is partly reflected and partly absorbed. A white surface reflects a great deal and absorbs very little incident light, while a black surface, such as black velvet or cloth, reflects very little but absorbs a great deal of light. Transparent bodies, such as glass, exercise very little absorption, the greater part of the light reaching them being reflected and transmitted. But between the two extremes there exist translucent substances, in which the amount of light absorbed bears a fair proportion to that transmitted and reflected by them. These latter substances have been employed in photometric measurements for the purpose of weakening the stronger light in bringing it into comparison with the weaker.

White writing-paper is translucent and will serve as an illustration of the way in which light is absorbed in passing through an absorbent body. Suppose we allow light of a given intensity, i, to fall upon writing-paper of such a thickness that in passing through only the m^{th} part of it, or im, arrives at the other side, the rest being absorbed under way; then if this light, im, be made to go through a second thickness the light will be reduced to an m^{th} part, or to $i\,m^2$, and similarly the light arriving through n thicknesses would be $i\,m^n$. For instance, ordinary white paper allows about 50 per cent. of the light falling upon it to pass through; therefore if the light falling upon the paper be 1·000, the light passing through one sheet will be = 0·500; two sheets $0{\cdot}5^2 = 0{\cdot}250$; three sheets $0{\cdot}5^3 = 0{\cdot}125$, and so on.

The absorption of rays of light for the purpose of photometry was first suggested by Lampadius,* who proposed to interpose several sheets of thin horn between the eye and the light until the latter disappeared. At a later date De Maistre † made a proposition to employ a prism of blue glass with one of white glass laid together, so that the limiting surfaces should be parallel and the light pass through without refraction, but the light of course be absorbed differently at different points. The constant of absorption being determined for all points of the glass, the reduction of two lights to an apparent equality through different parts of the coloured wedge would undoubtedly have enabled the operator to calculate the relative amounts of blue in the two lights, but as to the other colours no information whatever could have been gained. De Maistre's suggestion of coloured glass was certainly a clumsy one. No less so was Quetelet's ‡ proposition to employ two prisms of blue glass which were slid together so as to form a plane parallel plate whose thickness can be varied.

Lampadius' proposition to employ the vanishing point as a unit of measure is more interesting than useful. If the eye were constant in the degree of its sensitiveness the vanishing point of an observed light might be employed as a constant quantity. But as a matter of fact, the light which is invisible to the observer at one moment may be quite visible after the eye has become more accustomed to darkness, and therefore more sensitive, so that the unit of measurement would have a varying value. Nevertheless, the vanishing point may be employed so long as the operator uses it only as a means of comparison and avoids falling into the mistake of assigning an absolute value to it.

Some years since, a friend of ours employed a system of photometry based upon the suggestion of Lampadius. The experiments then made showed that such a system might be

* Gehler's "Wörterbuch." Second edition. Vol. vii., p. 482.
† "Bibl. Univers. de Genève," vol. li., p. 323. "Pogg. Ann," vol. xxix., p. 187.
‡ "Pogg. Ann.," vol. xxix., p. 187—189.

made to give approximate results if alternate observations were made with two lights. The apparatus used consisted of a wedge of deep neutral tinted glass, *a*, *b*, *c*, fig. 2, corrected by a reverse wedge, *a*, *d*, *c*, of white glass, and mounted in a suitable frame with rack and pinion, and a scale and

FIG. 2.

vernier, and an eye-piece, so that a source of light or an illuminated object could be observed through the wedge, which could then be shifted on so as to interpose a greater thickness until the object disappeared. The constant of absorption of the wedge was ascertained as follows:—Assuming the intensity of the light at its vanishing point to be = *a*, the thickness of the wedge, *n* and n^1, at the vanishing points of the two lights, λ and λ^1, and the absorption due to the unit of thickness, *m*, we have—

$$a = \lambda\, m^n \text{ for one observation, and}$$
$$a = \lambda^1\, m^{n^1} \text{ for the other,}$$

whence for the relation between the two lights λ and λ^1

$$\frac{\lambda^1}{\lambda} = m^{n - n^1}$$

$\frac{\lambda^1}{\lambda}$ and *n* and n^1 being known, the co-efficient of absorption *m* is got by the formula

$$\log m = \frac{\log \frac{\lambda^1}{\lambda}}{n - n^1}$$

To ascertain the illuminating power of a flame, the intensity of which we know, with an instrument of this kind, we should either have to take into account the extent or area of the luminous surface or measure the intensity of the illumination by it of some suitable object only. With this instrument the illuminating power of a light is best measured by observing the vanishing point of a white figure on a black background, such as white paper on black cloth or velvet when the figure is alternately illuminated by the unit light and the light which is under comparison.

Combination (distance and absorption) photometer.—In the photometer which has been for some time used by Mr. Sabine and may be found to be convenient, the constant light of a paraffin burner and the light to be measured are brought as nearly as possible to an equality by the interposition of thicknesses of translucent material, the final adjustment being made by alteration of distance. In making an observation the constant of the photometer is first ascertained by comparing the paraffin lamp with a standard candle, which is then removed and replaced by the electric or other light to be measured. The effect of different tints of the lights upon the eye is lessened by inserting in a portion of the field of view some pieces of coloured glass, which render the eye partly unconscious of small differences of tint without reducing its sensitiveness of appreciating the balance of illuminating effect. We shall give a detailed description of this apparatus later on.

ELECTRIC LIGHTING BY INCANDESCENCE.

III.

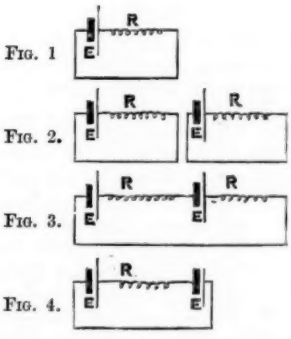
(*Continued from page* 193.)

We have seen that similar wires of carbon, platinum, and copper become heated to very different temperatures when traversed by the same current, the copper being elevated 209° only when the platinum is raised 2,500°—or, in other words, the platinum is heated 12 times as much as the copper. In the case of carbon, this substance becomes increased in temperature 2,500° when the platinum is only increased by 34°—that is, the carbon becomes heated more than 70 times more than the platinum.

It must not be imagined, however, that, irrespective of their relative durabilities, carbon is 70 times as good as platinum, or platinum 12 times as good as copper for illuminating purposes. As a matter of fact, for a given horse-power expended, similar pieces of each of the three substances in question would have the same number of heat units generated in them; that is, they would become illuminated to the same degree of intensity—*i.e.*, for example, six inches of copper, platinum, or carbon wire, each $\frac{1}{100}$th of an inch in diameter, would, if the same amount of horse-power were expended on each in generating a current through them, become heated to the same degree of intensity.

Let us now consider the law of the generation of heat in a resistance by an electric current. If we take a one-cell Daniell battery of practically no resistance and join it through a high resistance, a certain amount of heat will be generated in the latter, and a certain amount of copper will be thrown down on the copper plate, and a certain amount of zinc dissolved from the zinc plate in the cell. If now we join a second cell in the circuit we shall have doubled the electromotive force, and consequently the current flowing in the circuit will be doubled, but the amount of heat generated on the resistance will be more than doubled, it will be quadrupled. The reason of this is as follows:—It is evident that since we have doubled the current flowing in the circuit, the amount of current passing in the first cell is doubled, and therefore the quantity of copper thrown down on the copper plate, and the quantity of zinc dissolved in a given time, is doubled. But as we have two cells in the circuit, the total amount of copper thrown down and of zinc dissolved is four times what it was at first; and as a battery produces force by the expenditure of material (decomposition of sulphate of copper into copper and sulphuric acid, &c.), just as force is produced by the combustion of coal in a steam-engine, therefore by doubling the electromotive force we have quadrupled the amount of energy—that is, the amount of heat developed in the wire. The heat generated, in fact, varies as the *square* of the current flowing in the circuit. At first sight this law seems paradoxical, and to many it is a matter of great difficulty to understand it. The following explanation, therefore, may make the matter clearer.

Fig. 1 shows a single cell battery, E, joined up in circuit with a resistance, R; we have therefore a certain amount of heat generated in the resistance, R. Fig. 2 shows *two* such circuits; in this case it is evident that the *total* amount of heat which is being generated by the two circuits is *twice* that generated by the single circuit. If now we combine the two circuits, as shown by fig. 3, we still have the same condition of affairs as that which existed when the arrangement was that shown by fig. 2—in other words, the resistances, R, R, remain heated to the same extent. But if finally we remove one of the resistances, R, so that the circuit is that shown by fig. 4, then if we can suppose in the first place that no change has taken place in the strength of the current, it is still evident that the heat which was generated and distributed over two resistances, R, R, is now distributed over one only, and consequently the change must have caused the single resistance, R, to have become heated to twice the extent that it was originally. But further still, the change in the resistance of the circuit from 2 R to R must



have doubled the strength of the current, and for this reason also the amount of heat developed in R must have become doubled. It therefore follows that the actual development of heat, under the conditions shown by fig. 4, must be four times that which occurs when the circuit is that shown by fig. 1.

We see then that the quantity of heat developed in a resistance varies as the *square* of the current passing, but the heat developed varies also as the resistance overcome; hence we have Joule's law,

$$H = C^2R,$$

where H is the number of heat units developed.

Since we have

$$C = \frac{E}{R},$$

where E is the electromotive force producing the current, therefore

$$H = \frac{E^2}{R^2} \times R = \frac{E^2}{R} = EC.$$

The relative resistances of platinum and carbon at the normal temperature of the air are 5·6 and 6,500 (*see* Article I. page 73), and if we suppose wires of each of these materials to have become increased in temperature by 2,500°, then their relative resistances would be as

$$5{\cdot}6 \times 2^{\frac{2500°}{455°}} \text{ to } \frac{6500}{2^{\frac{2500°}{2500°}}}$$

or as

$$252 \text{ to } 3250.$$

That is to say, if we have two wires of equal length and gauge, one of platinum and the other of carbon, then if they are both heated to 2,500°, the carbon will have about thirteen times the resistance of the platinum. Now according to Joule's law the heating effect varies directly as the square of the current strength, and also directly as the resistance, and if we suppose the two wires in question to be heated to the same extent, we must have

$$\frac{E^2}{252} = \frac{E_1^2}{3250}$$

where E is the electromotive force producing the current through the platinum wire, and E_1, the electromotive force producing the current through the carbon wire. We have therefore

$$E : E_1 :: \sqrt{252} : \sqrt{3250}$$

or

$$E : E_1 :: 15{\cdot}875 : 57{\cdot}009$$

That is,

$$E_1 = 3{\cdot}59\ E,$$

showing that the electromotive force necessary to produce incandescence in a carbon wire or filament would be about 3½ times that required to produce incandescence in a platinum wire of the same length and diameter.

(*To be continued.*)

THE TELEPHONE CASE.

In the High Court of Justice. Chancery Division.
Before MR. JUSTICE FRY.

THE UNITED TELEPHONE COMPANY, LIMITED,
v.
HARRISON, COX-WALKER & Co.

THIS important patent action appears likely to be a lengthy one. The plaintiff company are owners of the well-known patents for Edison's and Bell's inventions, and they complain that the defendants have sold telephones which infringe both the transmitter of Edison and the receiver of Bell.

Mr. Aston, Q.C., Mr. Webster, Q.C., Mr. Cozens Hardy, Q.C., and Mr. Moulton appeared for the plaintiffs; Mr. J. Pearson, Q.C., Mr. Hemming, Q.C., Mr. Goodeve, and Mr. F. L. Muirhead for the defendants. At the commencement of the trial on Monday last, the day was chiefly occupied by Mr. Aston in his opening address for the plaintiff company, and Sir Frederick Bramwell was for a short time in the witness-box. On Tuesday the examination of Sir Frederick was concluded, and Sir William Thomson was then called for the plaintiffs, and his evidence was not concluded when the Court rose on Wednesday. Amongst the witnesses for the defendants are the well-known names of Professors Ayrton, Silvanus Thompson, Barrett, and Dolbear. We may refer more fully to this matter in our next issue.

THE MOTIVE POWER FOR DRIVING DYNAMO-ELECTRIC MACHINES AT THE CRYSTAL PALACE.

II.

ADJOINING the stand of Messrs. G. & H. Gwynne, and perhaps attracting even more attention than their engines which we mentioned in our first article, are several of those patented by Mr. Hodson. They are rotary engines, with direct attachment to the dynamo-electric machines which they actuate, so that driving belts are entirely unnecessary even at excessively high speeds. Examples of these are to be found in other portions of the building, and we give the following particulars concerning them. There are now being shown in the Electrical Exhibition :—

1. In the Brush Light Company's machinery annexe, a rotary engine which has been constantly at work for eight months without requiring the slightest amount of repair, and drives a No. 4 Brush machine, giving three arc lights of 2,000 (?) candle-power each. This engine of 5 horse-power runs at a speed of 1,000 revolutions per minute, and with the boiler as exhibited, and dynamo machine attached, forms a very portable and complete set of generating apparatus.

2. In the British Electric Light Company's station a 5 horse-power engine drives an "A" Gramme machine at 1,000 revolutions per minute, the steam being supplied from a small locomotive boiler close by. Although there is at present but one Gramme machine attached to this engine, both boiler and engine are quite equal to driving two machines; and when these are coupled one to each end of the engine shaft, the whole forms a very portable lighting plant for incandescent work, and is extremely handy to move about when any building requires to be lit up on short notice, as is often the case. A 16 horse-power rotary engine attached to a "D" Gramme machine is exhibited at the same station. The same company also exhibit a rotary engine of 2 horse-power at their office in the central nave. The engine is highly finished and attached to a Gramme machine of the "M" class, which will give sufficient current for 10 incandescent lamps.

3. In the machinery hall, western corridor, adjoining Gwynne's exhibit, are shown several of these engines, three of which are driving "A" Gramme machines direct, and generating the current for Hawkes' light in the western gallery. These engines are 5 horse-power each, and run at a uniform speed of 1,000 revolutions per minute. A small 2 horse-power engine is attached to a "M" Gramme machine, which, running at a speed of 1,600 revolutions per minute, lights up the space with a number of Swan's incandescent lamps. The current for driving the Griscom motors in the eastern gallery is generated by a small Siemens machine, attached to one of these engines; and in the space adjoining, a 5 horse-power engine drives a Siemens dynamo, the current from which works several wood-cutting machines, with a second dynamo as an electro-motor. Besides those already mentioned, there are several engines applicable for driving different sizes of generators exhibited, ranging in power from 5 to 20 horse.

These engines are specially adapted for driving dynamo machines, on account of their extreme regularity. They form a particular feature in the exhibition, it being claimed for them that they are the only direct-acting engines in the Palace, although this is not precisely correct, two of Messrs. Gwynne's engines being also direct-acting in the proper acceptation of the term.

We have received very good accounts of these engines from our friends at the Crystal Palace, and although opinions differ somewhat as to the amount of hard work these direct-acting engines would stand without derangement, especially when running at very high speed, the general verdict seems favourable. Indeed, their construction is so simple that the only apparently weak place appears to be in the valve which rises and falls with the piston as it rotates. This, however, may be more apparent than real, so that, all things considered, these engines seem to be admirably adapted for the purpose to which they are put at the Crystal Palace, therefore for small installations of the electric light and portability they may well be recommended. The noise they make whilst at work might be considered

objectionable at first, but being continuous and not intermittent it is soon overlooked.

We believe the Hodson engine has been employed successfully on board ship for working sounding apparatus, and for other work connected with submarine cable laying. They have also been supplied to the Spanish Government for driving the dynamo-electric machines which produce the currents for the search lights on ships of war.

The "Otto" gas-engines manufactured by Messrs. Crossley Brothers are now so well known that probably almost every person has at least seen them at work. It is therefore unnecessary to devote any space to comments upon their capabilities here. The various types in action at the Crystal Palace, and the uses to which they are put, are as follows:—

16 horse-power nominal, indicates 40 horse-power, driving the shafting from which various dynamos are worked. A similar engine is used at the Mansion House for the electric light, and an identical one for working the printing machines at the *Pall Mall Gazette* office.

12 horse-power nominal, indicates 23 horse-power. Three of these are shown, one working five of Siemens continuous current dynamo-machines for four Mackenzie arc lights and for some Lane-Fox incandescent lamps. The other two drive alternating current Gramme dynamo machine for the Jablochkoff system.

8 horse-power nominal, indicates 14 horse-power. Is driving Elmore's dynamo machine for electro-plating at Mr. Elmore's stand.

2 horse-power nominal, indicates 3·9 horse-power. Is used by Messrs. Elkington and Co. for driving a Wilde's machine for electro-plating.

¾ horse-power nominal, with Siemens S. D. 6 dynamo machine on same bed-plate, and working 10 Swan's 20-candle lamps. This is specially designed for a small installation up to 10 lamps, the cost of gas at London prices being under 1½d. per hour when working full power. We are informed that the working cost of the large Ottos at London prices of gas is only ¾d. per hour per indicated horse-power.

In referring to gas-engines, Mr. Dugald Clerk said in his recent paper "On the Theory of the Gas-engine," which was read before the members of the Institution of Civil Engineers on the 4th of April:—"The gas-engine was as yet in its infancy, and many long years of work were necessary before it could rank with the steam-engine in capacity for all manner of uses. The time would come when factories, railways, and ships would be driven by gas-engines as efficient as any steam-engine, and much safer and more economical of fuel. The steam-engine converted so small an amount of the heat used by it into work, that, although it was the glory and the honour of the first half of this century, it should be a standing reproach to engineers and scientists of the present time, having constantly before them the researches of Mayer and Joule."

NOTES ON THE LAW AND PRACTICE RELATING TO LETTERS PATENT FOR INVENTIONS IN THE UNITED KINGDOM.

By T. J. HANDFORD.

(*Continued from page* 263.)

X. Confirmation of Letters Patent.

We have yet to speak of another mode of imparting validity to a patent voidable from want of novelty, viz., by what is termed the "Confirmation of Letters Patent." In cases where a patentee believed himself to be the inventor at the time when he applied for his patent, but afterwards discovered that the validity of the patent could be called into question by reason of the prior publication other than in the specification of a patent, or the partial prior user of the invention by some person other than the patentee himself, such partial prior user having been discontinued at the date of his patent, he may petition her Majesty in Council to confirm the letters patent, and interested persons may enter opposition to the application for confirmation, both parties being heard before the Judicial Committee.

As, however, applications for confirmations of letters patent are seldom made, and when made are most sparingly granted, it will be sufficient to have simply adverted to the subject, without entering further into details as to the procedure adopted.

XI. Advice to Inventors.

The first step that an inventor should take is to obtain provisional protection in Great Britain for his invention, so as to secure priority. He should next satisfy himself by searches and inquiries that there is a reasonable ground for believing the invention is novel and original, and then give "notice to proceed," and apply for the seal as soon as possible. This does not involve the filing of the complete specification before the specified time, nor indeed is it desirable to file it until just before the expiration of the period of provisional protection.

If the inventor contemplates patenting his invention abroad or in the colonies, it is advisable to take steps with that view before in any way publishing it in the United Kingdom. In the case of a French patent, the invention should not have been published anywhere before the patent is applied for; and in Germany a patent is invalid, even although granted, if the invention was made known by printed publication in the country or elsewhere prior to the date of the application.

Where, however, the law is not so exacting as it is in France and Germany, it is usually a condition of the validity of the patent that the invention should be new in the particular State; and when we consider the rapid means of communication and intimate intercourse existing between Great Britain and the Continent or colonies, it will be obvious that as a rule publication cannot be safely made in this country until the invention is duly protected wherever it is desired to secure it. In some of the colonies, however, as for example in Canada and India, a period of grace is allowed, dating from the British patent, within which the colonial patent must be applied for, and in the United States of America the law is still more liberal, as a *bonâ fide* inventor may obtain a patent even although the invention has been in use in the States for not more than two years.

Another point of some importance is the order in which the foreign and colonial patents are taken out. In some States, as for example the Scandinavian countries and Russia, patents are granted for only a comparatively short term; and as it is the law in some foreign countries, and almost universally so in the British colonies, that the patent expires on the lapse of any patent taken previously for the same invention elsewhere, if great care is not exercised in this matter the patentee will incur the risk of having the duration of some of his most valuable patents curtailed. The best plan is to determine at the outset in what countries and colonies it is desirable to secure protection, and then make the *application* as soon as possible in all of them, but defer the *issue* of the short term patents until the other patents are granted.

Having obtained the patents, the next point is to observe and comply with the conditions upon which they are granted, in order to maintain them in force. In most foreign countries the patents are kept up by annuities, and in many of the British colonies, as in Great Britain, the maintenance of the patents is contingent upon certain periodical payments. It is also almost universally the rule in continental countries (and a similar condition is imposed in some of the colonies) that the invention is to be put into operation in the particular State within a fixed period; and in some cases, in France for example, the patent is forfeited if the patented article is imported (except with special permission), and in other cases, as in Canada, the patent is invalidated if the patented article be imported after a certain period. Again, in some States, as in the United States and Canada, the patentee is required to mark the patented article "patented," and in others, as in Norway, the performance of certain special duties is entailed in the exercise of the invention.

Attention to the foregoing points cannot be too strongly urged upon patentees. Experience proves that inventors as a class are not wanting in enterprise, as they will invest large

sums in the protection of their inventions; but having obtained their patents they frequently take little trouble to comply with the conditions under which the patents are granted, and thus do not reap the return to which they are entitled for the capital expended.

It is therefore hoped that these few words of advice will be found a not inappropriate sequel to the notes on patent law and practice, and that inventors acting upon the suggestions thrown out will be enabled to derive the utmost benefit from their inventions, both in regard to a maximum duration of the privilege and the indefeasible character of their title in Great Britain and its dependencies, and abroad.

ERRATUM.—In our issue of April 15th an awkward transposition of the type occurs. On page 262, second column, line 29 comes in at the wrong place, it should follow line 31.

UNSCIENTIFIC JOURNALISM.

WE had occasion some time since to criticise somewhat adversely an article which appeared in a contemporary whose pages are professedly devoted to mechanical matters. The article to which we refer was written in response to inquiries concerning the cost of fitting up certain installations of the electric light. The erroneous and misleading statements published by our contemporary were evidently made through sheer ignorance of the subject, and we dealt fully with the errors contained therein (*vide* ELEC. REV., January 21). Our criticism was not intended to be of a hostile nature, but merely to induce periodicals not particularly interested in electrical matters to be more accurate when attempting to supply information on a subject which requires technical knowledge of a peculiar kind, and which cannot therefore be expected in every journal outside the profession we represent. Our remarks, however, were apparently deeply impressed upon those responsible for the editing of the journal in question, and they have therefore seized upon paltry pretexts to attack us in a petty and vindictive spirit. Fortunately they have had but few opportunities, and at present we can call to mind but two, and the first of these we should have ignored had it not been for the second. It will be well remembered by our readers that we stated in our issue of March 4th, when speaking of the Faure accumulators, "It has been said for some time past that Sir William Thomson had privately admitted being mistaken as to their efficacy and practicability." Sir William replied to this by a letter which we published, and in which he gave an unqualified denial to this, as an incorrect statement. The contemporary to whom we have referred could not let such an opportunity as this pass without comment, so the appended note appeared in the issue of the following week :—

A quasi-scientific journal having, by no means for the first time, ventured out of its depth, presents in its last issue a spectacle that in any other case would be pitiable in floundering attempts to clear itself from a serious charge. Our hypercritical contemporary having asserted that Sir William Thomson had admitted having been mistaken as to the efficiency and practicability of the Faure accumulator, Sir William Thomson emphatically and publicly denied the impeachment on the earliest possible occasion. The leek thus presented is munched with a bad grace.

As before mentioned, we should never have alluded to such a pitiable attempt at criticism but for the recent attack upon us, for all those who read our article carefully would see that our statement did not come forward as authoritative, but was qualified by "*it has been said.*" However, we insert the note for the amusement of our readers. The second and more abusive attempt at criticising our articles appeared in our contemporary's issue of the 22nd of the present month, and is based upon our description of Messrs. J. and H. Gwynne's engines used at the Crystal Palace for driving dynamo-electric machines. It runs as follows :—

A CURIOUS ENGINE.—A "*quasi*-scientific" contemporary, more remarkable for the boldness of its assertions and for indiscriminate partisanship than for accuracy of information, amuses itself occasionally by self-sufficient criticisms of the articles contained in more ably-conducted journals. This Esau of journalism has evidently a high opinion of itself, indeed, its conceit requires to be balanced by the amount of wisdom it displays in order to make a fair average of the two. In a late issue it attacks one of the leading engineering journals in such a manner as to excite pity, but not for the attacked. Funnily enough, in the same issue it undertakes to describe some of the engines exhibited at the Crystal Palace, one of which, by a well-known maker, we are gravely assured has the crosshead and piston of one piece of steel. Moreover, the engine is widely known under its original signification of the "——" (we suppress the name). The whole description appears to be ignorantly condensed from the trade circulars of the makers, and amusingly betrays a want of literary and technical ability on the part of the self-appointed critic.

We may cursorily mention that the term "quasi-scientific" was applied by us to those journals which attempt to deal with any and every science, instead of keeping quietly within their own domain, and was used when we had occasion to devote a portion of our columns to the flat contradiction of the statements contained in the article mentioned at the beginning concerning the cost of electric lighting, and in this category our contemporary was included. Our journal, not being connected with any "clique," is independent, and therefore not given to partisanship. As to our accuracy of information, we are always open to correction when we insert anything in error. More for the sake of our critic than anything else, we sent a copy of our journal to Messrs. Gwynne, with that part of our description underlined which appears so funny, and we have received a reply from that firm with the assurance that our statements were perfectly correct. As to the name under which Messrs. Gwynne's engines have so long been known, we would refer our contemporary to the following lines in the "leading engineering journal" which we have attacked. "They have adapted their well-known centrifugal *pump engines* with great success to drive dynamos." We may add in conclusion that this attack which we are guilty of on one of the leading engineering journals was thrust upon us for the self-same reasons that compelled us to comment so adversely upon our contemporary's before-mentioned article, and which, by the recent addition to the literature of electric lighting which we criticised in such a way as to deserve pity, has a worthy companion. Now that we have been so far drawn from our "high opinion" of ourselves as to descend sufficiently to notice the effusions of our critic, we shall go on in peace, and shall hope that the *Mechanical World* (our contemporary) will now rest satisfied with the results of its endeavours to injure our position in the eyes of the scientific world, in which happily we are too well known to fear a misconstruction of the situation.

THE LATE DR. FIFE JAMIESON.

WE regret to announce that on Monday, the 18th inst., Dr. Jamieson breathed his last at the Manse, Old Aberdeen, at the early age of 28 years. He was a brother of Mr. Andrew Jamieson, the well-known electrician, and present Principal of the Glasgow College of Science and Art. Born on the 19th March, 1854, he was educated at the Gymnasium, Old Aberdeen, and at the University he took his M.A. degree in 1873. In August of that year he became electrician in Dr. Siemens' Submarine Cable Works, Woolwich; in May, 1874, second electrician in the Direct Atlantic Cable Expedition, on board the ss. *Faraday;* and subsequently electrician in charge of the Direct Cable in North America, till the end of the expedition in November, 1875. Along with Sir William Thomson, he was author of "The Conjoined Report on the Electrical Condition of the Direct Atlantic Cable," published in the TELEGRAPHIC JOURNAL AND ELECTRICAL REVIEW, 1876. He was noted amongst his electrical friends for his lively caricature sketches, some of which were so highly thought of by Mr. Von Chauvin, that he had them photographed. Having resigned his appointment on account of ill health, he returned to Aberdeen and studied medicine from 1876 to 1880. Devoting himself enthusiastically to the study of medicine, he distinguished himself in nearly all the classes, in several of which he was first prizeman, and in 1880 graduated M.B. and C.M., with first-class honourable distinction in Medicine and Surgery. From May, 1879, to May, 1880, he was House Surgeon in the Royal Infirmary. He was then appointed Demonstrator of Anatomy in the University, and in that position he has continued to the present time. Alike in private and in public life, Dr. Fife Jamieson gained the esteem and affection of all with whom he came in contact.

CORRESPONDENCE.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer, not necessarily for publication, but as a guarantee of good faith.

Correspondence should arrive not later than Tuesday morning if it is desired to appear in the following number

RELAY ELECTRO-MAGNETS.

To the Editor of The Electrical Review.

Sir,—In your issue of the 15th inst., in answer to a letter from Mr. Stone, you explain how to make an electro-magnet sluggish. Now, sir, if you will kindly give some information on how to improve a sluggish electro-magnet, you would, I am sure, be doing a great service to many of your practical readers.

In long circuits, where the ordinary relay electro-magnet is used to join a local circuit, it often happens that there is a strong tendency for the armature of the relay coil to join up the local circuit when *no current is being sent*, the relay coil acting as a magnet on its armature. Whether this effect is due to atmospheric influences, earth currents, or residual magnetism in the coil, and how best to treat such, are points on which some reliable information would be very valuable to many of your readers as well as to your correspondent.

Respectfully yours,
DENSHIN.

Dundee, *April* 18*th*, 1882.

[Residual magnetism in badly annealed cores is often the cause of a relay tongue getting a bias on the marking side: such an effect can best be got over by annealing the iron. An electro-magnet or a relay, either polarised or unpolarised, may be rendered very quick and certain in its action by introducing an "electro-magnetic *shunt*" between its terminals. This shunt consists simply of an ordinary electro-magnet, with its armature fixed on its poles: its resistance (in order to produce the best effect) should be equal to that of the relay. When a current goes out to line, half goes through the relay and half through the electro-magnetic shunt; when the current is cut off, the shunt produces a reverse discharge current through the relay, which entirely wipes out any residual magnetism which may have remained in it. In the case of a polarised relay whose tongue is set in the neutral position, the reverse discharge will, on the cessation of the line current, throw the tongue over to the spacing side. The power of the electro-magnetic shunt may be diminished by introducing a resistance in its circuit, or by sliding its armature partially off its poles. In the case of an unpolarised relay which is sluggish in its action from the cores being badly annealed, it is evident that the power of the electro-magnetic shunt must not be more than sufficient to wipe out the residual magnetism, otherwise the cores will become weakly repolarised by the discharge, though with the reverse polarity to that they had at first. A condenser placed between the poles of a relay or an electro-magnet acts in the same way as an electro-magnetic shunt, though its effect is not so powerful as the latter. If any of the coils of an electro-magnet become by any accident partially short circuited, they will retard the action of the latter, as the short circuited coils act as a shunt, and cause an action similar to that pointed out in the reply to Mr. Stone.—Ed. Elec. Rev.]

THE ACTION OF THE TELEPHONE.

To the Editor of The Electrical Review.

Sir,—Mr. J. W. Giltay, in making his experiment to prove that the microphone does not produce articulate speech by a make-and-break action, seems to have overlooked the fact that the charge in a condenser (whose insulation is good) does not fall to zero when a break occurs in the circuit, that is when the battery is disconnected. The charge can only fall by the poles of the condenser being connected together; hence Mr. Giltay's experiment proves nothing. It is somewhat difficult to see how "melodies sung into a Reiss transmitter were very clearly heard in the telephone when the condenser was in circuit." I can only account for it on the supposition that the insulation of the condenser was not perfect, and that it acted in consequence simply as a high resistance, a resistance too great to allow of the small variation in the microphone to produce any effect, but not too great to enable absolute makes-and-breaks to be perceptible. If Mr. Giltay wishes the make-and-break of the Reiss transmitter to cause the condenser to become charged and discharged, he must join up the battery, telephone, and condenser in circuit, and then connect the transmitter as a shunt between the terminals of the battery, and not place it direct in the circuit.

Yours faithfully,
TELEPHONE.

April 26*th*.

NOTES.

Mexican Cables Extension.—The ss. *G. E. Wood*, chartered by the India-rubber, Gutta-percha, and Telegraph Works Company, left the Silvertown Works on Monday morning, the 24th inst., for Greenhithe, and after adjusting compasses sailed from there the same day for Galveston. Mr. H. Benest goes out in charge of the *G. E. Wood*.

The ss. *International*, Captain W. F. Wardroper, with the greater part of the cable on board, left the Silvertown Works on Wednesday evening, the 26th, and after swinging off Greenhithe sailed for Kingston, Jamaica, on Thursday, the 27th inst. As we already stated in a previous number, Mr. Theophilus Smith and Mr. J. Rymer-Jones there join the *International*, Mr. Smith taking charge of the expedition.

Cable for the North Coast of Africa.—The *Charente*, one of the cable ships belonging to the French Government, is expected to arrive to-day (the 29th) off the Silvertown Telegraph Works, to ship the cable which has been manufactured by the Silvertown Company for the French Telegraph Administration.

She has already been docked and thoroughly overhauled at Toulon, and on shipment of the cable will immediately proceed to lay it between Bone and Biserte, on the North coast of Africa.

Jay Gould's Cables.—The ss. *Faraday* returned from her Atlantic trip on the 14th inst., and after having been docked, moored alongside Messrs. Siemens Bros. & Co.'s works at Charlton on the 20th. We understand that she is now taking on board grappling rope and buoys, and intends leaving the river shortly, on her fourth trip, to complete Jay Gould's cables.

Existing Charts and Cable Expeditions.—We have received a new Admiralty chart, No. 2,854, showing harbours in the Gulf of Mexico, with a sketch survey of Tampico Harbour, made in the steamship *Dacia*, of the India-rubber, Gutta-percha, and Telegraph Works Company. This survey was made during the landing operations of the two shore-ends for Tampico, near the mouth of the Panuco River, of the Mexican Telegraph Company's cables, laid in the beginning of last year. We understand that on the arrival of the ss. *Dacia* off Tampico, it was found that the coast line, as shown on existing charts, was not sufficiently accurate to proceed with the cable laying operations, and a very careful survey was therefore made. Some 280 soundings were taken, to be able to judge of the best landing place for the shore-ends, and the result was that the place where the hut had already been erected by the Mexican Telegraph Company was found to be unsuitable for landing the cables, and the hut, therefore, had to be moved to a more suitable position, about one mile further to the north. The bar off the entrance of the Panuco River and the river itself as far as Tampico town, were at the same time carefully surveyed in the *Dacia's* steam launch, and the position of the two prominent trees, one of which is known as the "Higueron," and which serve as landmarks for vessels making for Tampico port, was accurately determined. This survey was made by Mr. A. S. Page, who was the hydrographer of the ss. *Dacia*, under the supervision of Mr. R. K. Gray, engineer-in-chief of the

expedition. As Tampico is becoming an important port in the Gulf of Mexico, this survey no doubt will prove a great benefit to the mercantile marine.

TURKISH TELEGRAPHS.—We clip the following from the *Daily Chronicle* of the 25th inst. :—"Izzet Effendi, director of posts and telegraphs in Turkey, has signed a contract with Messrs. Siemens, of London, for the construction and laying of a cable between Hedjas and Egypt, which will be placed in connection with a land line to Mecca and Yemen." Hedjas is the northern and Yemen the southern part of strip of land on the east coast of the Red Sea, belonging to Turkey.

In Egypt the land-lines go as far as Sawakin and Musawwa. At the first named place the width of the Red Sea is about 150 n. miles, and at the other place some 190 n. miles; but the coast off Musawwa is very bad for landing a cable, there being a large number of reefs and small islands.

EARTH CURRENTS.—Strong earth currents interrupted working on all circuits except Dundee Forfar last Monday, and in a less degree the principal circuits were interrupted for two or three days following. On Monday especially they changed rapidly from positive to negative, and had a potential of about 21 volts.

Another Account.—Accompanying a severe snow-storm in the north of Scotland was a magnetic storm of more than usual violence. About 1.40 a.m. on the 17th inst., earth currents began to show themselves on the long circuits running south-east, afterwards extending to the shorter ones, and finally passing over to those running south-west. The directions of these currents varied from — to + with rapidity. About 9 a.m. the circuits in the south of Scotland had resumed their normal condition; not so those in the north. There the currents made themselves felt during the whole day, and requiring as many as forty cells Daniell in several instances to eliminate their malign influences. About 1.40 p.m. the south circuits were again taken up by earth-currents, and continued so until about 9 p.m. when they cleared away.

On the 19th inst. difficulty in working many of the circuits was experienced, owing to the presence of earth-currents, but not to the same extent as on the 17th.

THE ELECTRIC LIGHTING BILL.—The Electric Lighting Bill was discussed at considerable length by the Council of the Association of Municipal Corporations. The meeting was held at the offices in Westminster on the 20th of April, and there was a large attendance, including representatives of the town councils of Manchester, Liverpool, Birmingham, Leeds, Middlesborough, Leicester, Reading, Norwich, and other principal towns. After a long and animated discussion it was resolved to memorialise the President of the Board of Trade for the adoption in his bill of the following amendments suggested by the council :—"No application for a licence or provisional orders under this Act shall be made in respect of all or any part of any district of gas supply of a local authority, without three months' notice to such local authority, who shall be entitled within that period to make application for a licence or provisional orders, and until such application has been disposed of no other application shall be made or entertained. No powers of public lighting now vested in the local authority in relation to streets shall be interfered with or affected by any provisional order, except by agreement with the local authority. That no electric lines or overhead works across or over streets be authorised by any provisional order without the consent of the local authority."

At the meeting of the Board of Works on April 21st, the Parliamentary Committee reported that they had considered the Electric Lighting Bill introduced into Parliament by the Board of Trade, and were of opinion that the provisions of the bill were such as would meet with the Board's approval.

In the House of Commons on Monday last the following electric light companies' bills were read a second time :—The Anglo-American Brush Electric Light Corporation, and the British Electric Light Company.

On Monday last, at a special meeting of the Court of Common Council, the acting Remembrancer (Sir T. J. Nelson) suggested that the Electric Lighting Bill promoted by Her Majesty's Government should be referred to the Commissioners of Sewers, which was agreed to.

The Committee of Selection have added the following six members to the Select Committee on the Electric Lighting Bill, in addition to the nine already nominated by the House of Commons :—Mr. Mitchell Henry, Sir James M'Garel-Hogg, Mr. Alderman M'Arthur (Lambeth), Mr. Story Maskelyne, Mr. Puleston, and Mr. Edward Stanhope.

PROPOSED ELECTRIC RAILWAY IN LONDON.—On Tuesday last a select committee of the House of Commons passed a bill which authorises the incorporation of a company for the construction of an electric railway from Charing Cross, commencing at a point near the north-west end of Northumberland Avenue, passing under the river Thames, and terminating near Vine Street, under the loop-line station of the Waterloo terminus.

RESISTANCE OF DYNAMO MACHINES.—The following letter to the *Scientific American* may interest our readers :—

To the Editor of the Scientific American.

Some time ago Mr. Weston and I had a discussion in your columns regarding the proper resistance of dynamo machines. Mr. Weston then claimed that low resistance machines were wrong in principle and impractical. Mr. Edison then claimed by his practice that a low resistance machine was the best form. His experiments have now resulted in a practical machine, which is running in London, having a resistance of one two-thousandth of an ohm. On this resistance he is able to convert 125 horse-power of energy into electricity with a minimum loss, and to avail himself of 97 per cent. of the electricity outside of the machine.

FRANCIS R. UPTON.

Menlo Park, N. J., March 28th, 1882.

THE ELECTRIC LIGHT AT THE LUTON EXHIBITION.—The lighting of this Exhibition during Easter week by the Joel and Pilsen systems of semi-incandescence and arc respectively was very successful, the arrangements being in the hands of Mr. R. H. Newington. The working of the Pilsen lamp was a theme of general observation, and attracted great attention.

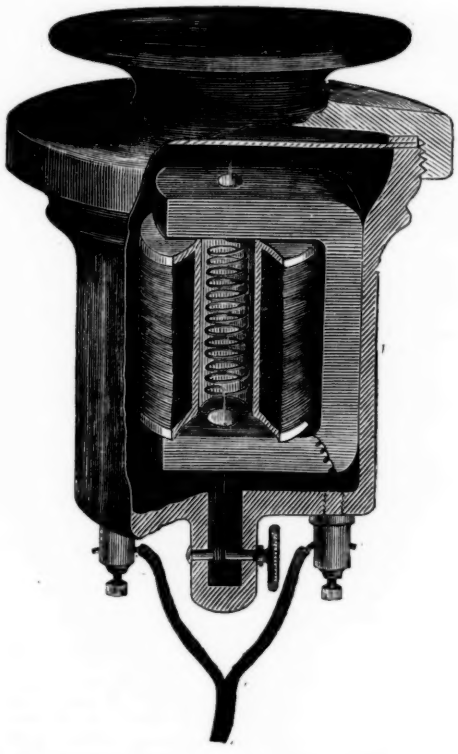
REFLECTORS FOR THE ELECTRIC LIGHT.—At the Crystal Palace last week Mr. Deputy Brass, in speaking of the electric light, called attention to the necessity of employing reflectors so as to utilise more of the light which is now wasted above. He, however, condemned the use of concave reflectors as used at the Holborn Viaduct, on the ground that they concentrated the light at the foot of the lamp-post, and he therefore recommended the use of convex reflectors which would diffuse the light.

THE SMOKE NUISANCES ACT AND THE ELECTRIC LIGHT. — Mr. Frederick Landon, the Secretary of the Electric Light and Power Company (Limited), situate in Bankside, was summoned, by order of the Home Secretary, under the Smoke Nuisance Act, for using furnaces at the factory not constructed so as to consume the smoke. The solicitor to the company said that all the furnaces were being put in proper order. Mr. Bridge ordered the defendant to pay a penalty of 20s. and 33s. 6d. costs.

THE HAMMOND COMPANY ELECTRICAL ENGINEERING COLLEGE.—We have before noticed that the Hammond Electric Light and Power Supply Company were about to start an electrical engineering college, to meet the various requirements connected with the proper installation of electric light apparatus. The operations of this college are stated to commence on the 1st of July next with a limited number of premium pupils only, and if the number of applications exceed the limit fixed, the preference will be given to the sons of shareholders in the Hammond Company. The objects of the college will extend so as to cover a thorough scientific training in all branches of electrical engineering; and the company will, as its operations extend, be able to give employment to an increasing number of engineers, those of their own teaching being of course preferred. The laboratory of the college contains, in addition to the ordinary electrical instruments, dynamo-electric machines of various types, so as to enable students

to thoroughly understand the different systems of electric lighting now employed. The principal of the college is Mr. Hugh E. Harrison, B.Sc., and the electrical engineer Mr. T. C. Phillips, the consulting electrician of the Brush Company. Doubtless the operations of this scheme, if carried out in accordance with the prospectus, will confer considerable benefits upon those choosing to go in for the course of two years' instruction, and although we have already several institutions where such tuition may be obtained, it is perhaps in these latter cases of a more limited character than that which Messrs. Hammond are so well able to supply. As far as the teaching in these colleges is concerned, we have before expressed our opinion that in no case can better instruction be obtained than at the City and Guilds of London Institute. There is, however, ample room for such a venture as that proposed by the Hammond Company, and we see no reason why, if seriously conducted, it should not be very successful. In addition to being able to master the practical use and capabilities of the different systems with which they will be brought into contact, we hope the students will also be made to understand the theoretical ideas upon which such systems are based, so that in cases of emergency they may be able to act for themselves, without being absolutely dependent on a superintending electrician for advice.

Thornberry's Telephone Receiver.—We illustrate a new telephone receiver, the action of which is due to the contraction of a spiral magnet core under the influence of the current traversing the bobbin. The spiral core is attached at one end to the diaphragm, and is connected at the other end with an adjusting screw. The spiral core is perfectly free to work in the helix, and the contraction or expansion of the spiral under the influence of the current

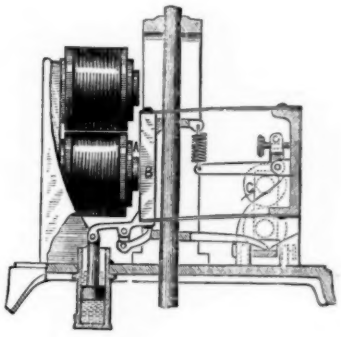


from the transmitter acts on the diaphragm in much the same manner as though it was attracted by a magnet, the results being the same as in Bell's, Gray's, or Phelps' instruments.

A permanent magnet placed outside the bobbin magnetises the "spiral core" by induction, so that the spiral is very sensitive, thereby making it sensitive to the influence of currents passing in the bobbin. The inventor expects to partially, at least, overcome the influence of induced currents in the receiver, and to obtain more distinct articulation.

The construction of the telephone will be readily understood by reference to the engraving, in which a portion of the instrument is broken away to show the internal parts. The diaphragm is mounted on a mouthpiece of the usual description, and the permanent magnet and bobbin with the inclosed spiral is placed in a small casing attached to the mouthpiece. The instrument is provided with the usual binding posts and flexible connections.—*Scientific American.*

Electric Lamp.—Patent No. 255,148. Filed in the United States of America Patent Office, November 11th, 1881.—By L. E. Curtis.



Claim.—1. In an electric lamp, the combination, with the feed-controlling magnets, of a carbon-carrier, a clamp or clutch, a closed shunt of high resistance, and an electro-magnet, independent of the feed-controlling magnets, included therein, and mechanism adapted to be operated by the said magnet, and thereby liberate the said carrier from the clutch, as set forth.

2. In an electric lamp, the combination, with the feed-controlling magnets, of a carbon-carrier, a clutch by means of which the carrier is controlled, a shunt-circuit of high resistance, and a magnet, independent of the feed-controlling magnets, included therein, by the action of which the clutch is caused to release the carrier, substantially as set forth.

3. In an electric lamp, the combination, with the feed-regulating mechanism and carbon-carrier controlled thereby, of two electro-magnets independent of the feed-regulating mechanism, one in the main circuit, the other in a shunt about the lamp, and mechanism controlled by the differential action of said magnets for the purpose of releasing the carbon-carrier from the control of the feed mechanism, substantially as set forth.

Minerals, Chemicals, &c.—We extract the following from George G. Blackwell's weekly report. Iron ore: Antrim, No. 1, 12s.; No. 2, 10s. 6d. to 11s.; Cumberland, 16s. to 17s.; Devonshire, 14s.; Campanil, 9s. f.o.b.; Porman, manganiferous, 14s.; purple ore, 12s. 6d. Barytes continues in good demand, and best lump carbonate is very scarce at 87s. 6d. to 90s.; seconds, 70s. to 72s. 6d.; common, 62s. 6d. to 65s.; finest ground, £6 to £7 10s. Sulphate is also in request, and selected lumps are selling at 42s. 6d. to 45s.; first class, 22s.; good, 20s.; extra quality, ground, 82s. 6d.; best, 75s.; good, 60s. to 62s. 6d.; fair, 47s. 6d. to 50s.; common, 45s. China clay: finest quality, 42s. 6d. to 45s.; good, 32s. 6d. to 35s.; fair, 22s. 6d. Emery stone: there is a parcel of "best brand" afloat, for which £6 to £6 10s. is asked. Fluor and felspar are quiet, and prices remain unchanged. French chalk: our arrivals this week amount to 500 bags, but as little or none went into store, prices are maintained, and firm to £5 10s. for best quality. Asbestos: floss, £24; Canadian rock, £23 10s.; common, £18. Phosphate of lime, 1s. 5d. per unit. Tungsten metal, 3s. 6d. per lb. Magnesite (containing 98 per cent. carbonate of magnesia): there is a very strong demand springing up for this article, and prices are well maintained. Manganese ore, steady at last quotations. Ferro-manganese: 50 per cent., £14; 70 per cent., £22. Antimony ore: best, £18 10s.; crude, £24. Plumbago: best, £19 to £20; good, £10 to £12. Pyrites, iron and cupreous, 6d. per unit. Resin, good medium, £8. The market for chemicals this week has been steady, with little change in prices. Soda ash, 1 7-16d.; caustic

soda, 60 per cent. white, £8 12s. 6d. ; cream, £8 5s. ; 70 per cent. white, £9 15s. ; bicarbonate, £8 15s. to £8 17s. 6d. Chlorate of potash, 5½d. to 6d. per lb. Bichromate, 6d. Salt cake, 35s. Soda crystals, £3 10s. Sulphur : roll, £8 15s.; flour, £11 15s. Copperas, 45s. ; in bulk at works, 22s. 6d. Arsenic, best refined Cornish, £10 10s.; grey, £8. Sulphate of copper, best, £19 10s. to £20. Metallic sodium, 7s. 6d. per lb. Chloride of calcium, 60s. Metallic cadmium, 7s. 9d. per lb. Chloride of barium, 1s. 6d. per lb. Chlorate of soda, 1s. 3d. per lb. Nitrate of strontia, 51s. 6d. to 52s. Tungstate of soda, firm at 90s. Blanc fix, £9. Nitrate of baryta, for chemical purposes, 33s.; best refined, 34s.; double refined, 35s. 6d. Carbonate of magnesia, 52s. Manganese, sulphate, firm to £21. Borate, 9d. to 11d. per lb. Chloride, £23 10s. to £24. Acetate keeps scarce. Nickel salts for plating, 2s. per lb. Salammoniac, best, 45s. 6d.; seconds, 44s. 6d. Muriate of ammonia : white, 32s. 6d.; grey, 30s. 6d. Sulphate of alumina, £6. Muriate of potash, £9 15s. Hydrate of alumina, £21, for quantities. Nitrate of soda, 15s. 3d. Montreal potashes, 29s. 6d. to 29s. 9d. Shellac : orange, £9 15s.; good, £9. Carbonate of potash, 30s. Verdigris, 10d. to 1s. per lb.

NEW COMPANIES REGISTERED.

CALLENDER'S BITUMEN TELEGRAPH AND WATERPROOF COMPANY, LIMITED.—Registered Office, 101, Leadenhall Street. Capital £40,000 in £10 shares. Objects : To acquire the business of manufacturers of bitumen and waterproofing materials carried on by the Messrs. Callender at Belevedere, Erith, together with the property and assets connected therewith, including their letters patent for "Improvements in the manufacture of compound materials intended for use in the manufacture of waterproof articles, and other purposes," and for "Improvements in the manufacture of telegraph conductors, and materials for covering and insulating wire and other conductors used for telegraphic, electric lighting, and similar purposes." The purchase consideration is £30,000 in paid-up shares, £3,000 in 10 per cent. debentures, and £7,000 in cash. The signatories (with one share each) : *W. O. Callender, T. O. Callender, and W. M. Callender, 101, Leadenhall Street ; J. D. Sargent, 53, Union Road, Clapham Road ; J. Craig and J. Craig, junr., 12, Lawrence Lane ; and W. J. C. Hendrey, 36 and 37, Mincing Lane. Directing qualification : 50 shares. Messrs. David Painter McEuen, Henry David Anderson, and Henry Drake, are directors ; remuneration : £200 per annum, and also £2 10s. per cent. upon the amount of all dividends and bonuses. Registered 19th inst. by Drake, Son and Parton, 24, Rood Lane.

BRUSH ELECTRIC LIGHT AND POWER COMPANY OF SCOTLAND, LIMITED.—Capital £300,000 in £5 shares. Objects : To acquire the goodwill, undertaking, and property of the Scottish Brush Electric Light and Power Company, Limited. Signatories (with one share each) : A. H. Moses, 57, Cleveland Square ; P. P. Rowe, 75, King Edward's Road, Hackney ; *Thomas Dickson, 123, Bishopsgate Street Within ; *Hon. Ashley G. P. Ponsonby, 9, Princes Gardens ; H. R. Gordon, Hatton Court, E.C. ; W. P. Hope, Leith ; Robert Ewing, 47, Bedford Gardens. Directing qualification, £250 (nominal) in shares or stock. Mr. William Ladd is one of the first directors. Directors' remuneration, £1,500 per annum. Registered 25th inst. by Harries, Wilkins and Raikes, 24, Coleman Street.

PHŒNIX MEMNON COMPANY, LIMITED.—Capital £1,600 in £8 shares. Objects : To construct and supply mechanical and electrical appliances, and for such purposes to take over the business of James Thomson, sen., Engineer, of Baker's Lane, Buckden, Huntingdon. Signatories : *J. D. Herd, Oxford, 64 shares ; *J. R. Langley, Oxford, 32 shares ; J. G. Langley, Buckden, 1 share ; *W. Thomson, Shaw, near Oldham, 45 shares ; J. Thomson, Buckden, 20 shares ; J. R. Thomson, Buckden, 32 shares ; Miss Sarah E. Thomson, Buckden, 2 shares. Mr. Robert Thomson is appointed a director. Registered 25th inst. by T. Mallam, o Staples Inn.

* Signatories whose names are preceded by an asterisk are also directors.

NEW PATENTS—1882.

1867. "Electric arc lamps." A. B. BROWN. Dated April 19.

1875. "Secondary batteries." D. G. FITZGERALD, C. H. W. BIGGS, and W. W. BEAUMONT. Dated April 19.

1878. "Dynamo-electric machines." J. H. JOHNSON. (Communicated by J. M. A. Gerard-Lescuyer.) Dated April 19.

1884. "Improved methods or processes of separating metals and metalloids from thin ores and other substances by means of electricity." W. R. LAKE. (Communicated by E. Marchese.) Dated April 19.

1895. "Electric lighting and incandescent lamps." P. M. JUSTICE. (Communicated by A. Cruto.) Dated April 20.

1896. "Telephonic and telegraphic signalling apparatus." A. C. BROWN and H. A. C. SAUNDERS. Dated April 20.

1901. "Voltaic batteries." A. R. BENNETT. Dated April 21.

1915. "Electric lamps." W. T. WHITEMAN. (Communicated by M. Bauer & Co.) Dated April 22.

1919. "Electric arc lamps." J. LEA. Dated April 22.

1940. "Electric batteries." W. R. LAKE. (Communicated by L. Maiche.) Dated April 24.

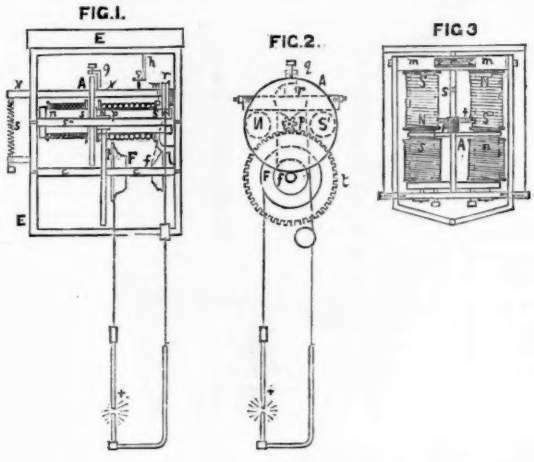
1945. "Improvements in the arrangement of and in the mechanism for telephone alarms or individual calls." W. MORGAN-BROWN. (Communicated by J. F. Kettell.) Dated April 25.

1946. "Construction of secondary batteries." C. V. BOYS. Dated April 25.

1956. "Electric batteries and apparatus and means connected therewith." T. J. HANDFORD. (Communicated by B. Jarriant.) Dated April 25.

ABSTRACTS OF PUBLISHED SPECIFICATIONS, 1881.

3473. "Electric lamps, &c." E. J. HARLING and E. HARTMANN. Dated August 11. 6d. Consists in the combination and arrangement A mechanism for regulating automatically the relative position of the electrodes or points of the carbons employed in electric lamps, whereby such object is effected in a more regular and continuous manner than is the case when arrangements of mechanism as ordinarily constructed are used. That part of our said invention which relates to the arrangement of a brake is also applicable to other analogous purposes. Fig. 1 is a section of the mechanism of the lamp taken



longitudinally through the electro-magnets ; fig. 2 is a view at right angles to the last-mentioned figure of a portion of the mechanism ; fig. 3 is a plan of the said mechanism. A is a rotating armature, and $s^{\times}$ is the spindle thereof ; F, *f*, are fusees. On the spindle, $s^{\times}$, is the pinion, *p*, gearing into the wheel, *t*, on the spindle of the fusees. The lever, *x*, which is pivoted at x^1, has attached to it the bar armature, *m*, carrying the roller, *r*, over which is carried the cord from the smaller fusee, *f*, and *s* is the adjustable spring attached to the other end of the lever. N^1, S^1, and N, S, are the two first-mentioned electro-magnets, and *n*, *s*, is the electro-magnet with the fine wire helix ; E is the frame of the apparatus. The electric current passes through the helices of the electro-magnets, N^1, S^1, and N, S, and thence through the carbons. The fine wire helices of the electro-magnet, *n*, *s*, being connected with the two terminals or other equivalent part of the lamp, constitute a branch circuit independent of the main circuit through the electro-magnets, N^1, S^1, and N, S, and the carbons. When an electric current passes through the lamp the electro-magnets, N^1, S^1, and N, S, will attract the armature, *m*, downwards in opposition to the spring, *s* ; such downward movement of the armature, *m*, and consequently of the roller, *r*, will lower the

lower carbon and thus separate the carbon points, thereby establishing the arc. The weight of the upper carbon on the periphery of the larger fusee, F, tends to make the carbons approach each other, but such movement is regulated by the attraction of the electro-magnets, N¹, S¹, and N, S, on the disc armature, A, preventing the same from revolving, thus arresting the feeding mechanism and keeping the carbons separated. As the carbon points are consumed, the length of the arc becomes greater and the resistance increases; consequently the current passing through the fine wire branch circuit of the electro-magnet, *n*, *s*, will increase, and with it the magnetism of the said magnet, until such increased magnetism counteracts the attraction of the electro-magnets, N¹, S¹, and N, S, on the rotating armature, and leaves the latter free to revolve, thus allowing the carbons to approach each other, and thereby decreasing the length and lessening the resistance of the arc until the current in the main circuit, and therewith the electro-magnets, N¹, S¹, and N, S, become sufficiently powerful to again arrest the disc armature, A, as above described. The armature, *m*, remains for a certain time in the position to which it is attracted by the electro-magnets, but as the length of the arc increases and the strength of the magnetism on the magnets, N¹, S¹, and N, S, decreases, the said armature, *m*, gradually moves away until it rests against the stop, *h*. Any further decrease in the current through the consumption of the carbons will be rectified by the rotating armature, but in the event of the rotating armature bringing the carbons too close together, they are again separated by the attraction of the electro-magnets, N¹, S¹, and N, S, on the armature, *m*, the disc armature, A, slowly revolving as the carbons are consumed.

3559. "Electric lighting, &c." C. W. Harrison. Dated August 16. 6d. Relates to improvements in electric lighting, and in the means or apparatus employed therein, and consists in intensifying the luminosity at the focus or point of light by partially surrounding the poles of the electrodes and arc by a reflector which reflects back into the arc or focus of light the light and heat rays passing in the direction of the reflector. The reflector is formed of uncrystallised oolite mineral mixed with plaster of Paris.

3679. "Electric light regulators." Sydney Pitt. (A communication from abroad by S. J. Burrell, of America.) Dated August 23. 6d. Has for its object improvements in electric light regulators. The regulator is intended to effect automatically the following operations:—First, to separate the points of the carbon electrodes to a proper distance from each other for the production of the electric arc when the electric current is established; second, to feed forward one of the carbon pencils at a rate sufficient to compensate the waste or destruction of the same, which takes place so long as the current is passing; and third, when the current from any cause is interrupted or ceases to traverse the lamp, to instantaneously bring the carbon electrodes into contact with each other.

3790. "Covering, protection, and insulation of electrical conductors or cables for telegraphic purposes, &c." W. R. Lake. (A communication from abroad by S. D. Strohm, of America.) Dated August 31. 6d. Relates to the employment of tubes or other conduits for the reception, protection, and insulation of wires, cables, or other conductors of electrical currents for telegraphic, telephonic, lighting, heating, and other purposes. The improvements have for their object to provide conduits which can be constructed at light expense, which can be readily put together and taken apart, and which, when in position for use, form a perfectly tight covering and effective insulator for wires, cables, and other conductors of electrical currents.

3808. "Conveying sound to a distance from theatres, &c., by telephonic transmission." C. D. Abel. (A communication from abroad by Clement Ader, of Paris.) Dated Sept. 1. 6d. Relates to improved means and apparatus whereby vocal and instrumental musical sounds, as well as dialogues or speeches that take place in theatres and such like localities, where the speaker or singer is apt to move about, may be effectually transmitted by telephone to other localities so as to be distinctly heard therein.

3809. "Telephonic exchanges." C. D. Abel. (A communication from abroad by La Société Generale des Telephones, of Paris.) Dated Sept. 1. 6d. Relates to improved apparatus and arrangements for facilitating the working of telephonic exchanges at the central stations. According to the present invention the telephonic circuits are composed of two wires instead of a single wire and the earth as heretofore, both wires being united in one and the same insulated covering, and seven sets of such double wires being grouped together in one cable, which consequently serves for seven subscribers. The groups of such cables passing from the underground conduits are led through an underground branch passage to the building of the central station. From this passage they pass into the building through a metal plate attached to the wall of the building, which plate has as many separate holes as there are cables in the group, whereby the cables are effectually separated from each other, and also the passage of offensive smells into the building through the passage communicating with the underground conduit is prevented. From this plate the cables are led along channels to the "rosasse" or apparatus, by which the connections are established between the conducting wires and the exchange apparatus, one half of the cables being led to the bottom and the other half to the top of the rosasse.

3812. "Transmitting secret messages by electro-magnetic telegraph." W. R. Lake. (A communication from abroad by A. F. Johnson and F. B. Johnson, both of America.) Dated Sept. 2. 10d. Relates to an improved method of and apparatus for transmitting secret messages by electro-magnetic telegraph instruments over ordinary telegraph wires. When this method is adopted the contents or purport of a message cannot be ascertained by a third party who may be in charge of the receiving instrument, or who may be watching its operations, but is disclosed only to the person to whom it is sent, the message being received by the latter printed on a strip of paper in transverse lines sealed and addressed.

3880. "Manufacture of revolving armatures and other parts of electrical apparatus, &c." W. R. Lake. (A communication from abroad by C. Dion, of America.) Dated Sept. 7. 10d. Relates chiefly to a novel construction of revolving armature for electro-dynamic machines, and to a novel process and mechanism for making the same.

3890. "Electric lamps." Desmond Gerald Fitz-Gerald. Dated Sept. 8. 6d. Relates to incandescent lamps. In producing the carbon filament paper or any suitable vegetable fibre, thread or fabric is treated with a concentrated solution of zinc chloride. The material is then thoroughly washed, first in acidulated water or a dilute ammoniacal solution, and afterwards in water, and lastly it is carbonised whilst protected from contact with air, as is well understood.

3893. "Electric lighting apparatus." W. R. Lake. (A communication from abroad by Warren Samuel Hill, of Boston, Massachusetts, United States of America.) Dated Sept. 8. Relates to electric lamps or lighting apparatus, and comprises various novel features hereinafter described. According to one part of the said invention a switch is provided, which is arranged and operated in a novel manner for changing the course of the electric current, so that when the carbons have been burned as low as desired the switch may be made to act mechanically to divert the current from its course through the carbons to a more direct passage whereby the regulating mechanism will be rendered inoperative and the light extinguished, without thereby affecting the other lamps in the same circuit.

3926. "Secondary batteries or magazines of electricity." J. S. Sellon. Dated Sept. 10. 6d. Relates to improvements in secondary batteries or magazines of electricity composed of plates of lead or of other suitable material, which are or may be coated with or have attached to or packed therein or thereon spongy precipitated or reduced lead or other spongy reduced or precipitated metal or metallic matter, such plates being immersed in cells, vessels, or receptacles containing acidulated water or other suitable liquid, the invention having for its object the providing the maximum of active surface

Fig. 1.

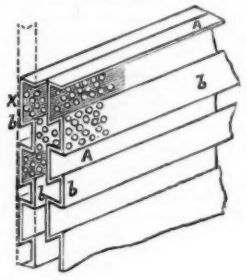


Fig. 2.

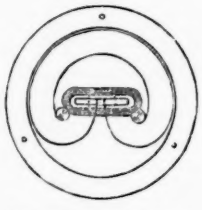
in the minimum space, so as to obtain a battery of great strength and contained in or occupying a small compass comparatively with its efficiency. Fig. 1 represents a perspective view of a perforated battery plate formed of dovetail section in accordance with one part of the said invention, such form being especially favourable for the retention of the spongy or other material to be packed therein. Fig. 2 shows the section of a portion of a perforated plate formed with angular projections or grooves, which may also be rounded, squared, or of any suitable form.

3929. "Multiplex and self-revertible 'Teleradiophone.'" E. J. P. Mercadier. Dated Sept. 10. 10d. Relates to a system of electric telegraph in which the signals are produced by radiophonic effects. At the same time the system, owing to its own character, allows of transmitting several simultaneous signals through a conductor in the required direction without its being necessary to add any accessory arrangement, such as an artificial line, a bridge, a differential relay, &c.

3932. "Dynamo or magneto-electric machines." Peter Jensen. (A communication from abroad by Thomas Alva Edison.) Dated Sept. 10. 6d. The object of one part of this invention is to produce such improvements upon the dynamo or magneto-electro machines, wherein are employed inductive bars running lengthwise of the armature, and connected at their ends by discs, as shown in British letters patent, No. 1240, of March 21, 1881, that a better connection between the ends of the bars and the discs will be formed, so as to prevent heating at those points; the connections between the discs and the commutator bars will have a larger conducting area, and be more rigid than in the construction shown in said patent, in order to prevent the heating of such connections, and also to prevent their breakage by vibration; the contacts of bars and rods with discs will be reduced in resistance and prevented from oxidising; the copper discs for connecting the ends of the bars will be located outside of the field of force or nearly so, and will not be heated by the circulation of currents induced in them when the circuit is open at the commutator by movement in the magnetic field; means will be provided for preventing electrical creeping between the edges of the copper discs; and finally, the copper inductive bars will be so insulated that the insulation cannot be pierced by the electricity, and at the same time the heat will be conducted off and not allowed to accumulate in the bars.

3944. "Telephones, &c." W. E. IRISH. Dated September 12. 6d. Relates to certain improvements in or applicable to telephones, and in part applicable to other electric apparatus, such as dynamo and other induction machines. In all the telephones hitherto devised the one pole or the two poles of the permanent magnet with which they are fitted is or are separately wound around with insulated wire, or they are otherwise wound or fitted with wire bobbins, so that in their usable condition the coils of the wire or of the bobbins completely encircle each pole passing between the poles when two are used. As the result of experiment that the inventor has made, greatly improved results

FIG. 1



can be obtained (when the improved apparatus is used as a receiver) as regards the increase of the volume of the reproduced sound by winding the wire in continuous convolutions around both the poles of the magnet as though they were but one pole, or by surrounding the two poles with but one bobbin of wire, as shown by the figure, and thus, when a current of electricity is sent through the wire, in an improved manner both the poles for reproducing the transmitted sounds are employed.

3946. "Telephones." W. E. IRISH. Dated Sept. 12. 2d. Relates to certain improvements in or applicable to telephones, has especial reference to the construction thereof, without the provision or necessity for permanent or electro-magnets with which they have hitherto been made. The usual vibrating diaphragm (consisting of a thin sheet or disc of metal wood, ebonite, mica, or other suitable material, is mounted on a rigid metal frame or ring, which is suitably secured to the inside of a containing case, the latter being furnished with a suitable mouthpiece on its outside front. Within the case is supported preferably by means of a light metal spring (insulated from the case when the case is made of a conducting material), a piece of platinum, carbon, or other suitable conductor, as a point of contact, the spring being arranged so as to allow the contact point to reach the centre of the diaphragm, or other means of giving out the sound, against which it is lightly pressed by a second spring (similarly insulated if necessary), which also carries a contact, preferably of carbon or platinum. The one of these springs is connected to the line-wire, and the other to the battery-wire. The improved telephone can be made serviceable both as a transmitter and as a receiver without necessitating change of position of the head, or of the telephone, or the use of two telephones, so that conversation can be carried on by people at a distance as continuously and uninterruptedly as if they were speaking *vis-à-vis* by inclosing the springs and contacts within a funnel-shaped collector, the base of which is secured to the inside front of the case, so as to collect the reproduced sounds given out by the contacts and diaphragm; and to the apex of the funnel, which is perforated, is secured a flexible pipe or tube which is furnished at its outer extremity with an ear-piece, through and by which the received or reproduced sounds are conveyed to the ear. (*Provisional only.*)

3987. "Secondary batteries or magazines of electricity." J. S. SELLON. Dated Sept. 15. 6d. Relates to improvements in the con-

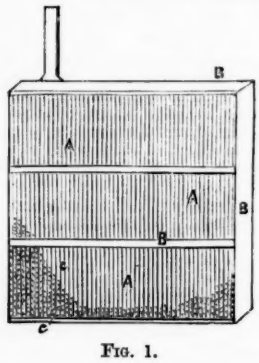


FIG. 1.

struction and arrangement of batteries known as secondary batteries, and used for the purpose of storing or magazining electricity, and it consists in the employment of plates or elements composed of two or more metals, of which lead and antimony are essential, and either consisting of plates or sheets of metals made to adhere by mechanical pressure or other equivalent means, or by the employment of metallic plates consisting of alloys of lead and antimony. The invention also consists in the construction and use of elements of a woven metallic fabric composed of and produced from lead when in the state or condition of wire strips, tubing, or other suitable divided form presenting a large retaining surface, which may be smooth, roughened, or indented as desired. Fig. 1 represents a side elevation of an element or plate of a secondary battery composed of a number of perforated lead strips (having suitable surfaces) or of metal fabric in accordance with one part of the present invention. The elements or plates, according to one arrangement, are formed of perforated lead in the condition of strips, A, having smooth, roughened, corrugated, or indented surfaces, or any suitable woven fabric or form suitably prepared, may be employed so as to retain the material to be packed therein or thereon, and attached at the sides, ends, top and bottom (and if desirable intermediately), or in any convenient position to pieces, rods, or tubes, B, of lead or other suitable metal, and then packed with finely divided material, *c*, already prepared or hereafter to be rendered active.

4005. "Storing electricity." J. S. SELLON. Dated Sept. 16. 2d. Consists in the employment as positive poles of sheets, foil, gauze, wires, pieces, or any form of suitable metal, metallic fabric or material. These are immersed in a bath or mass of any suitable metallic salts, either in solution or in a moistened condition, and a deposit of oxide of the salt obtained. (*Provisional only.*)

4017. "Electric lamps, &c." SHACKLETON HALLETT. Dated Sept. 17. 4d. Relates to certain improvements in electric lamps, in electrodes therefor, and in fitting up such electrodes and the lamps for the same, the object being to provide lamps of the incandescent kind of improved construction, and the electrodes for such lamps, and in fitting up such electrodes.

4019. "Generating dynamic electricity." G. E. DERING. Dated Sept. 17. 6d. Relates to improvements in gas batteries.

4024. "Electric lamps." W. MORGAN-BROWN. (A communication from abroad by E. M. Fox, of America.) Dated Sept. 19. 2d. Relates to electric lamps, for which vacuum chambers or globes of glass are employed, and have for their object to facilitate the operation of drawing the vacuum, and to dispense with the usual operation of sealing off the chamber after the vacuum is drawn. (*Provisional only.*)

4026. "Dynamo-electric and magneto-electric machines." ERNEST DE PASS. (A communication from abroad by La Société anonyme des Câbles électriques, système Berthoud, Borel, et Compagnie, of Paris.) Dated Sept. 19. 2d. The electric-motor which forms the subject of the present application for patent is based on the deflection or deviation produced by a current on a magnet or electro-magnet placed within a circuit. It consists substantially of a fixed circuit, within which a Siemens coil or an electro-magnet is arranged, the wires of which always receive a current in the same direction, whilst the surrounding coil is traversed at each half revolution by reverse currents. (*Provisional only.*)

4034. "Dynamo or magneto-electric machines and electro-motors." PETER JANSEN. (A communication from abroad by Thomas Alva Edison.) Dated Sept. 19. 6d. The current of electricity used in this system of electric lighting is generated at and distributed from a central station to and through the district of such station. At the central station is massed a number of generators sufficient to supply the wants of the entire district. These generators are connected in multiple arc, and the generative capacity of those in use is regulated and controlled by regulating and controlling the current passing through the coils of the field of force magnets. The object of this invention is chiefly to furnish means and methods for accomplishing this regulation. One method consists in arranging equal resistances in the circuit of each field of force coil, and cutting in or out equal portions of each simultaneously by hand or automatically, the result being accomplished in the latter case by the use of a special electric engine placed in a derived circuit to the main circuit, and provided with a governor, which on decrease or increase of speed actuates a switch cutting in or out a portion or all of the resistances.

4037. "Secondary batteries." W. CLARK. (A communication from abroad by Nicolas de Kabath, of Paris.) Dated Sept. 19. 6d. The object of this invention is to construct an apparatus for accumulating or storing electric energy in which the layers of binoxide of lead and of spongy lead with which the anode and kathode become coated may be of great thickness as compared with those of the Planté battery without liability of becoming detached. These layers are properly formed in a relatively short time notwithstanding variations of the current, and the electrodes are so arranged as to present a large extent of surface in a small compass and of little weight. There is taken as a support a sheet of lead, *a* (fig. 1), half a millimetre in thickness, which is moistened with dilute sulphuric

FIG. 1.

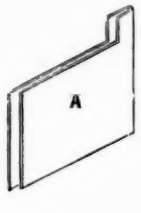


FIG. 2.

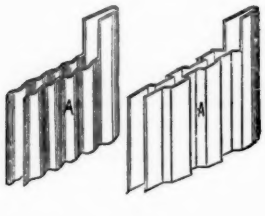


FIG. 3.

acid in order to form upon its surface a thin layer of sulphate of lead: there are also prepared in the same way other thin plates or laminæ of lead, *b*, about $\frac{1}{10}$th of a millimetre in thickness. The plate, *a*, is then covered with these thin plates, *b*, when suitably prepared by folding them around it, as shown in fig. 1, so that their extremities are upwards in the cell in order to permit of the escape of the gases generated in charging. The plates thus arranged are enveloped in one or more thicknesses of artificial parchment, *c*, according to the internal resistance desired. This parchment holds together the

plates or laminæ composing the electrode, increases the internal resistance of the battery, and serves to insulate from one another the composite electrodes. The plates thus combined may be of any suitable form; for example, they may be of either of the flat or corrugated forms shown in figs. 2 and 3.

4052. "Electrical alarm apparatus for the protection of dwelling-houses, &c., from burglary." H. H. Lake. (A communication from abroad by H. C. Roome, of America.) Dated Sept. 20. 1s. Relates to improvements in electric burglar alarm apparatus, and comprises means for ascertaining whether the electric circuit is or is not intact and in the proper condition, means for ascertaining whether an alarm proceeds from inside or outside a structure to be guarded, means whereby part of the premises protected may be maintained in circuit, and another part or parts cut or short-circuited out of the circuit; means whereby windows are effectually protected; and means whereby a telephonic transmitter is effectually utilised to detect attempts to gain access to premises guarded or articles contained therein.

4057. "Production and employment of continuous electric currents in railway carriages, &c." H. E. Newton. (A communication from abroad by the Société Universelle d'Electricité Tommasi, of Paris.) Dated Sept. 20. 6d. The object of this invention is to provide by means of a dynamo-electric machine a supply of electricity which will be available for the maintenance of any required number of electric lights, or for other uses, although that machine may be only intermittently in action.

4059. "Electrical bath apparatus." H. H. Lake. (A communication from abroad by Basile Barda, of Vienna.) Dated Sept. 20. 4d. The object of the present invention is to provide such modifications in the electro-magnetic bath apparatus described in the specification of former letters patent dated 14th March, A.D. 1881, No. 1107, as will enable the same to be advantageously employed for animals, and especially for horses. (*Provisional only.*)

4060. "Regulating the discharge of secondary batteries, &c." A. M. Clark. (A communication from abroad by Nicolas de Kabath, of Paris.) Dated Sept. 20. 6d. Consists in varying the amount of the liquid contained in the batteries so as to vary their resistance as required.

4093. "Electric cables." E. G. Brewer. (A communication from abroad by P. B. Delany and E. H. Johnson, both of America.) Dated Sept. 22. 2d. Relates to improvements upon the electric cable, wherein a series of insulated conducting wires are arranged in practically the same plane in a flat lead pipe, and are separated by intervening walls of lead; and its object is to obviate the necessity for the great compression of the inclosing lead pipe, which is liable to injure the insulating covering of the wires or the corrugating and possible weakening of such lead pipe, one of which methods has been required heretofore in the manufacture of said cable in order to effect the complete separation of the wires by intervening lead walls. (*Provisional only.*)

4127. "Fire-alarm wire or communicator." B. J. B. Mills. (A communication from abroad by P. A. Charpentier, of Paris.) Dated Sept. 24. 2d. Has for its object the production of an improved fire-alarm wire or communicator, in which the passage of the current is produced by means of a metallic soldering effected by the rise of temperature.

5221. "Apparatus to be controlled and operated by electricity for stopping trains and giving signals on railways." W. R. Lake. (A communication from abroad by W. Cass Shaffer, of America.) Dated Nov. 29. 6d. Has for its objects the stoppage of trains and the giving of signals on railways. The said invention consists essentially in providing the locomotive with means which are connected to the steam supply pipe, the steam, air, or other brakes, and the steam whistle, and are controlled by electrically operated devices along the line, whereby in the event of danger an alarm will be sounded, the steam cut off, and the brakes operated automatically.

CITY NOTES.

Old Broad Street.

THE CONSOLIDATED TELEPHONE CONSTRUCTION AND MAINTENANCE COMPANY, LIMITED.

The directors' report to the shareholders contains a statement of accounts to March 31st, 1882. The manufacturing operations of the company have extended little over a period of six months, and they have been conducted under great disadvantage, owing to the factory first established proving too small for the demands upon its resources. The net profits of the company amount to £23,087 13s. 9d., out of which £5,000, equal to sixpence a share, was paid as an interim dividend on December 31st. At the time the interim dividend was declared, the directors announced it to be their intention to pay regular quarterly dividends of the same amount, feeling assured that the shareholders would approve of this policy. They therefore propose to pay regular quarterly dividends on June 30th, September 30th, and December 31st. The balance of dividend for each year ending March 31st will have to be declared at the annual meeting. To enable this course to be adopted, it has been thought desirable to carry £6,000 of the profits to a suspense account, to guard against any possible loss on the outstanding balance due to the company. It must be understood that this is not in consequence of any of the assets being considered doubtful; but as the outstanding accounts are large, and likely to continue to be so, it is considered that this reserve will operate as a measure of protection. Out of the balance of £17,087 13s. 9d., £1,458 0s. 4d. has been written off the preliminary expenditure account; and the directors recommend that £5,000 be appropriated to the present dividend, and that the balance of £5,629 13s. 5d. be carried forward. There will thus be more than the next quarter's dividend in hand. For interests the company possessed abroad, it has received £20,000 (less a commission of £750) in shares in the River Plate Telephone and Electric Light Company, Limited; and £175,000 in shares in the Edison Gower-Bell Company of Europe, Limited. The first of these is estimated to be fully worth the nominal value. At present it is difficult to precisely estimate the value of the second. The two together, the directors propose, shall be held in suspense to cover possible depreciations. At present it is not proposed to recommend dividends beyond 10 per cent. per annum, but the shareholders may reasonably look forward to the time when it will be prudent to distribute special bonuses in addition. The business of the company is in a most satisfactory condition. It has orders and contracts in hand, the execution of which will keep it fully employed for a long time to come, and the demand for telephones is continually on the increase. The new factory is well fitted up, and there is every reason to believe that it will answer the purposes of the company.

The adjourned general meeting of the above company was held on Monday last in the City Terminus Hotel, Cannon Street, Sir Julius Vogel, K.C.M.G., chairman of the company, presiding.

The secretary, Mr. Charles Curtoys, having read the notice convening the meeting, the minutes of the last meeting were unanimously approved.

The chairman said that he presumed the report would be taken as read. ("Agreed.") He continued: It is now my pleasant duty to propose that the report and accounts now submitted to the meeting be approved. Gentlemen, it is a very pleasant duty for me to congratulate you upon what I think I may term the success of the company hitherto. We commenced under some difficulties. It was thought advisable when we first commenced to establish a factory on a very small scale. There were certain litigations pending, with which we were not directly concerned, but we considered that a more modest way of beginning would be better for telephone interests in general. But our modest beginnings were soon found to be quite insufficient for our requirements, and we have now a large factory thoroughly well fitted up, lighted by the electric light, and capable, I think and hope, of meeting the demands made upon it. Hitherto, I may say, our difficulty has been a difficulty which the shareholders will be pleased to learn, to supply sufficient telephones for the demand upon us. We have always found it difficult to meet the large demand from our customers and the contracts we have in hand. As regards the accounts, I think they sufficiently explain themselves. It is not necessary for me to go through them in detail. The net profit is £23,087. Out of this it is proposed, after some portion of the preliminary expenses have been written off, that there should be a reserve fund formed to meet any deficiency which might arise at any time in respect of outstanding accounts. Our outstanding accounts being large, and always likely to be large, it is thought desirable to make this reserve as soon as possible. £6,000 has been already paid to that account. It is proposed now to ask your sanction to a further payment of £5,000 being appropriated to the present dividend up to end of March, and that we should carry forward £5,600. I may explain that when first the question came before the directors of the division of profit, it was thought that it would be agreeable to the shareholders, this being a manufacturing company and not a speculative one, that there should be a regular quarterly dividend paid which the shareholders might feel they could rely upon; and after making our calculations we thought we could recommend a rate of 10 per cent. per annum, and we thought we could pay that regularly in quarterly dividends, leaving to future disposition the question of dividing special bonuses. We commenced that course in the summer, when we had only had about three months of effective work. The £5,000 proposed to be divided at the end of March will be at the rate of 10 per cent. per annum. If this policy meets with your approval, the course the directors will take will be to pay a dividend of 6d. per share at regular quarterly intervals in June, September, and December, the final dividend being always declared at the annual general meeting. It will be well to leave over for a time the question of dealing with profits in excess of that amount—*i.e.*, over £10 per cent. per share. Dealing with a company like ours, it is desirable there should be something in the shape of a reserve fund, and we think that the interests we have in the River Plate Telephone Company and in the Edison Gower-Bell Company of Europe will make a perfectly ample reserve against the depreciation of patents or anything else. In respect to these two interests, the Edison Gower-Bell Company is the outcome of a large amount of negotiation which ended in the fusion of the interests of the Edison Company and its rival on the Continent, and these interests we represented in our purchase from the Gower-Bell Company. The American interests were not taken into account when we made our purchase from the Gower-Bell Company, but of course it was best to make our interests in Europe very substantial, as they will become valuable later. That company has now established exchanges very widely, and it is in negotiation for certain patents in Russia, and also in negotiation with respect to other parts of the Continent. I will not be prepared to say that our interest is worth the nominal value of the shares, £175,000, or anything like it, but I think I may say this, that it is a substantial and valuable asset. Our shares in the River Plate Company are, I think, fully equal to their nominal amount, £20,000. So that as the result of the year's working, besides the 10 per cent. dividend paid, a specified amount has been put apart for a special reserve fund to meet any possible depreciation, and an amount has been carried forward equal to the quarterly dividend which it is proposed to pay. I hope you will think that this is a satisfactory conclusion of our year's business. You have in addition to that, and quite separate, the value of the River Plate shares and of the Edison Gower-Bell Company of Europe.

These we are not proposing to divide, and they remain as a substantial asset as a reserve to our benefit. So much with respect to the past, which I hope you will find satisfactory. As regards the future, we have contract engagements a very long way ahead. All our customers or clients, whether government or private, are continually urging us, like Oliver Twist, with a cry of "More, more!" Our difficulty is to keep up the supply, and that I hope is incidental to the fact that the telephone is making a very large amount of progress. I don't know whether I might not in a few remarks say something more regarding our future prospects and our position. I think it is as much the duty of the directors to prevent shareholders from undervaluing their property as it is their duty to ask them to abstain from overvaluing it. To give a clear idea of our position, I must travel out of the immediate purpose of this meeting, and shortly refer to both the United Telephone Company and the General Post Office. Our arrangement with the United Telephone Company is that that company for a long series of years is bound to buy all its instruments of us, and that applies not only to the United Telephone Company but to the companies affiliated to it. We are also the sole persons licensed to manufacture in this country telephones for export to foreign countries. Now as regards the Post Office, our position is that we have a contract with it for a considerable number of instruments, and a further additional contract for the supply of a very large additional number; and considering our position, it is necessary to refer to the position which the United Telephone Companies occupy. As most of you are aware, when the United Telephone Company became possessed of the monopoly of the telephone, the Post Office intervened, and claimed to have the right of using the telephone, as being an infringement upon the Government rights secured to it by statute in the Telegraph Act. The course was at the time considered a very unusual one, and many thought it was conceived in a narrow spirit. But I think, when we come to look at the circumstances, we cannot agree with that conclusion. The fact is the Post Office was bound to protect the very large interest which the nation had in the telegraph, and the Post Office saw at the very outset that the telephone was, not to say an *infringement* upon the telegraph, but in course of time likely more or less to supersede it altogether. Whatever parties we may belong to, whether we are Conservatives, Liberals, or Radicals, I do not think any of us will deny the very great ability shown by the present head of the Post Office, Professor Fawcett. I question whether in the memory of this generation there has been so able and efficient a Postmaster-general. Now, the Post Office takes the greatest interest in the progress of the telephone, and although I have had no communication on the subject, or any right to say it from any communication received, it is very obvious to me that they realise the fact that the telephone is bound, as I have said, to become not only the rival of the telegraph, but to supersede it, or to be amalgamated with it. Come to consider for a moment what is all that the telegraph gives you It gives you a very rapid postal system. Instead of sending a letter from Scotland to London, to occupy twenty-four hours, you can get it delivered in an hour. If from Westminster to the City, you may save the cost of sending a boy with your letter. Yet in the City it is not so good as a messenger, for he will go for 3d., and deliver it quicker than through the telegraph company. It is not safe to calculate on its being delivered through the telegraph within three-quarters of an hour of the time it leaves the sender. In the telegraph you have a very rapid postal delivery, but you cannot have an interchange of messages so satisfactory as the interchange of thought by yourself through the telephone, and there is no question of this, that the telephone is susceptible of being used for long distances. At present it is not so used with us, entirely owing to the fact that if allowed to be used for long distances it would very much clash with the operations of the telegraph department; but that it *can* be so used there is no doubt. On a system belonging to the Oriental Telephone Company, they use it between Alexandria and Cairo, and carry on a conversation with the greatest facility between the two places, 130 miles apart, and we have reason to think that a much larger limit may be used. I do not think there is much difficulty in arriving at the conclusion that sooner or later there must be a fusion of the two interests, telephone and telegraph. It is not for me to prophesy, I have no reasons for doing so, but that this is likely to be the case I cannot but think. Also I do not think that the telegraph interests will buy up the telephones, so if there *is* a fusion it will not be on *that* basis. There has been a great deal of litigation—necessarily there must be—in dealing with a valuable discovery like the telephone, and I believe an action has been commenced this very day upon the subject. I don't think it matters very greatly how it goes. The Post Office has shown itself very chary of granting further licences. It is very obvious that the larger the number of licences, the more it extends the permission to use the telephone through the country, the greater the difficulty will be when it comes to have to account with all the various interests that will be concerned in it. As far as we are concerned, I think I may say it matters little to us whether the monopoly is in the hands of the Post Office or the United Telephone Company, because our arrangements are such that the United Telephone Company or its assignees, and that applies equally to the affiliated companies, are bound to take all their telephones from us. As regards the Post Office, we have also this satisfactory feature to recollect: apart from the interests we inherit in the case of the telephones being acquired, and the obligations imperatively binding upon them, we are working in the utmost possible harmony with the Post Office in the way of improving the telephone. Scarcely a week elapses without the Post Office sending to us some suggestion for improving the instrument, and I may tell you that the instrument now in use is superlatively in excess of the original instrument, which shortly will, in my opinion, become almost obsolete. We think that at the Post Office an instrument will be brought out which will be better than anything yet brought forward. And it is in our opinion, the policy of our board not to trust to monopolies, nor to anything of the kind, but to qualify ourselves, by the instruments we produce, to hold our position. We should be assailed, and justly assailed, if we did not produce instruments which were satisfactory to the company. In short, it amounts to this—the progress of the telephone means the progress of this company, of which you are shareholders. I have much too high an opinion of the activity, commercial and social, of the people of this country, to believe that they will refuse to take the largest possible amount of advantage from what I will not hesitate to term the greatest discovery of this age, the telephone. I am obliged to you for the patience with which you have listened to me, and I hope I have not been too discursive, or trespassed upon you at too great a length. I have to move that the report and accounts, as now submitted, be approved.

Mr. Smith said that there was £170,000 for the Edison Gower-Bell telephone, and £20,000 for the River Plate Company, on both sides of the accounts. He did not quite understand the system on which that was done. The accounts he presumed meant that these sums would stand to their credit if these companies were successful, but he should like a word of explanation.

Mr. J. W. Bigelow seconded the chairman's motion.

Mr. Wm. Ford said that the question of the honourable proprietor was an exceedingly relevant one, and his understanding was that if these assets became productive they would be distributable assets as profits.

The Chairman said that they were premium shares, that would be divisible if the companies succeeded. Some of the companies followed the exceedingly bad plan of distributing dividends upon such assets.

Mr. E. H. Galsworthy said that the shareholders did not seem disposed to make many comments upon the report as submitted. He thought that the accounts and state of the company as explained by the chairman was a little too good to be passed over in absolute silence. With regard to the question put by the proprietor, he was glad that the information had been elicited; but he took it, in the absence of directors knowing the exact value of those shares, in the absence of knowledge of their exact value, that they should be held in suspense, to be dealt with at some future time, and when that time came they could possibly sell them, or consult the shareholders, and whatever assets they realised, this would be distributed, he presumed, amongst the shareholders as a bonus, and not by way of dividend. It was a capital thing that they were forming a reserve to restore the capital of the shareholders, and when that was done these assets could be distributed absolutely. He was one who was very well content with the idea of 10 per cent. dividend; he thought it was a rather charming prospect (laughter). He congratulated the board on the course they had taken, in not being tempted to go beyond 10 per cent. He thought one of the first duties of a board of directors was the formation of a reserve fund, and they had done exceedingly well in commencing its formation. The shareholders were indebted to the chairman for the way in which he had explained the position of the company. It was satisfactory to know that they were working in harmony with the Post Office. It was difficult to see the end of the telephone. So far from supplanting the telegraphs, one of their great objects should be to supplement the telegraphs by an extension of telephones where telegraphs were not carried. He was not quite clear whether the accounts gave all they ought to under the articles of association, which required an account of income and expenditure. The accounts were rather in the form of profit and loss accounts. They might consider whether they ought to be so given, and whether it was advisable to alter the articles at some future time. He offered his hearty congratulations to the board for the admirable way in which they were managing the affairs of the company.

Mr. Wm. Ford said he presumed the next quarterly dividend was over due, and therefore payable at once.

The Chairman said they always paid quarterly dividends in June, September, and December, but the final dividend would have to be declared at the general annual meeting. He might say that it had been a most laborious task to arrange with the various interests in purchasing the interests of the Gower-Bell Company. The River Plate Company was a growing company, and the accounts from this company's agent there were so exceedingly satisfactory, that he had no hesitation in saying that the shares were worth par. The Edison Gower-Bell Company required to be worked out carefully, and that would take some time.

In reply to a question as to whether they had parted with all their interests now, the chairman said that in South America they still had interests, and there were certain others which might grow up in other foreign countries where they had rights to use instruments. He was not in a position to give a more definite answer at present.

Mr. Smith said that with regard to the matter of preliminary expenses he would suggest that the share of these payable by this company should be paid before anything beyond the 10 per cent. was given to the shareholders.

Mr. Ford thought these matters should be left to the directors to deal with.

The Chairman said he entirely agreed with Mr. Smith's suggestion, but it was practically met by this fact, that 10 per cent. only was declared after the special sanction of a general meeting. He would now put the resolution—that a final dividend, of 6d. per share free of income tax be declared and paid.

The resolution was carried unanimously.

Mr. Smith moved that Messrs. Deloitte, Dever, Griffiths & Co., be re-elected auditors for the year, at a remuneration of fifty guineas.

Mr. Ford, in seconding the motion, said he took the opportunity to direct attention to the question or suggestion made by one of the shareholders who addressed the meeting, that these accounts did not show a trading account. He might call upon Mr. Griffiths to explain the absence of that.

Mr. J. G. Griffiths said that the reason for that omission was, that it was not deemed expedient by the directors or auditors to lay before

the public the state of the trade they were doing. It was quite sufficient to put the gross profits, without enlightening the public too much as to their operations.

Mr. E. H. Galsworthy said he quite concurred in Mr. Griffiths' explanation. It was decidedly *not* advisable to enter into such details.

The motion for the re-election of the auditors was then passed unanimously.

The Chairman said he had to move further, that a general meeting of the shareholders be held in the month of April or May. A clause in the articles provided that the meeting should be held after the financial year was closed, but it would be unwise to bind them as to a particular date. They wished a little latitude.

Mr. Ford seconded the motion, which was carried *nem con.*

Mr. Ford congratulated the board in rendering their accounts strictly in conformity with their articles of association. He had had a large experience of the working of articles of association, and he believed they were strictly within the powers conferred upon them.

Mr. Galsworthy said he had also had a large experience of such articles, and he was clearly of opinion that the accounts were *not* within them.

Mr. Smith moved a vote of thanks to the chairman and board of directors, which was seconded by Mr. Ford, and carried unanimously.

The chairman having briefly responded, the proceedings terminated.

REUTER'S TELEGRAM COMPANY, LIMITED.

The directors' report states that the net profits for the year ending the 31st December last, after payment of current charges and deducting rebate on unexpired subscriptions, amount to £5,779 18s. 1d., including £112 10s. 8d. brought forward from the last account. The usual interim dividend of 2½ per cent. was paid in October last, and the directors now declare a further dividend of 8s. per share, making a total distribution, free of income tax, of 7½ per cent. for the year. This will absorb £5,542 18s. 4d., and leave a balance of £236 19s. 9d. to be carried forward. The directors recommend that the amount allotted to the insurance and superannuation fund for the officers of the company be increased from £300 to £400 a year. A resolution to this effect will be submitted to the meeting. In conformity with the articles of association, Mr. James Sydney Stopford retires from the direction, but offers himself for re-election. The auditors, Messrs. Quilter, Ball, Crosbie, Glegg, and Welton, also offer themselves for re-election.

The eighteenth ordinary general meeting of the above company was held on Wednesday last in the company's offices, 26, Old Jewry, Colonel James Holland, chairman of the company, presiding.

The secretary *pro tem.* having read the notice convening the meeting,

The Chairman said: I suppose, gentlemen, you will take the report as read. ("Agreed.") I have only a very few remarks to make upon it. You will observe that a leading feature of this report is the very satisfactory increase to our receipts from subscriptions and commission, and a less satisfactory increase to our charges for telegrams and agencies. The increase is about £7,700 on the receipts, and the increase on the charges is somewhere about £6,000. There is a set-off on the other side in the reduction of about £1,500 on the current expenditure, so that the difference is not so great, although much greater than we could have wished. The cause of this increased expenditure is certainly not far to seek to those who have watched the events that have been occurring during the past year. In the first place, the Transvaal war and the Transvaal peace. I do not like to use political expressions, but neither of them have been extremely satisfactory in themselves to the country, and certainly they have been very costly to us, because we have been obliged to have our agents there at very considerable cost in order to report all events as they occurred. Then occurred the assassination of the Czar, another matter of very considerable importance. Then the assassination of the lamented President of the United States, his long and painful illness, and the interminable trial of his assassin, Guiteau. All these necessitated very considerable expenditure on our part. It is not an expenditure that we can regret, because it is of all things the very first of our duties to supply the earliest and the most accurate intelligence of all things occurring in any part of the world to the public, and it is not only our duty to endeavour to do this, but it is decidedly to our interest. Were we for a moment to forget that duty considerable competition would arise, and we think it is by far the most prudent method to stifle, as it were, competition in the bud by sparing no expense in order to fulfil our duty in the best manner we possibly can. Well, it will be satisfactory to you all to find that we have carried an increase to our reserve fund of £550 under the name of rent—rent that we would otherwise have to pay for the building. It is a freehold, and we have not yet thoroughly paid for it, but it has increased our reserve fund. It stood last year at £8,278, and this year it is £9,449. We have a freehold valued at £13,000, and a very good asset it is. The item representing sundry creditors, or rather sundry debtors, for the creditors are a matter of no particular importance to you, the sundry debtors are practically all run off. They are in a constant state of transition. We have some £8,000 or £10,000 distributed among some thirty agencies. We keep down the balances in hand as far as we can possibly go, and they are generally met very fairly, except in some unfortunate contingencies. Among the whole of our assets as here reported we have not anything that can be called a bad debt. There is certainly some £300 or £400 that may come under the term of doubtful, but we have still hopes of recovering the whole or a considerable portion of it. At any rate, there is time in another year to settle that account, and it is a very small item considering the nature and extent of our business. You will have observed, I daresay, gentlemen, that our respected and valued secretary is not occupying his usual seat at my right hand to-day. Mr. Griffiths, who is at all times devoted to his duty, and anxious to do everything to forward the interests of the company, undertook at our request to make a voyage to India, in order that he might not only supervise our establishment there, but place himself in personal communication with the leading authorities, with a view to carry out some arrangements that would be beneficial to us, and having been in India myself, I can say that it is no trifling exercise for a man travelling in India, as he has to travel from Calcutta to Simla, a distance of 1,500 miles, in the very midst of the hot season. Beyond that I have nothing else whatever to mention, unless you have any particular question to ask, beyond moving the adoption of the report and balance-sheet as you have seen it.

No questions being asked, Baron seconded the motion, which was carried unanimously.

The Chairman moved the re-election of James Sydney Stopford, Esq., who retired by rotation from the board.

Sir John Hay, M.P., seconded the motion which was also carried.

Mr. Stopford briefly returned thanks, after which Mr. W. T. Loveday moved that Messrs. Quilter, Ball, Crosbie, Glegg, and Watson, be re-elected as auditors, at the usual remuneration.

Mr. H. H. Oakes seconded the motion, which was carried *nem. con.*

The Chairman moved that the directors be and hereby are authorised to increase the maximum amount to be allotted out of the funds of the company, for the purpose of the Officers' Insurance Superannuation Fund, from £300 to £400 per annum. The object of the resolution was, that they might be able adequately to insure the valuable life of Mr. Griffiths, the Secretary. At the last meeting the sum of £300 had been sanctioned to insure the establishment. It was a plan that had worked most admirably, and one which was resorted to year after year more extensively by all substantial companies. It had the good effect of blending the interests of the employer and employed. Those who knew the great value of Mr. Griffiths to this establishment, would, he was sure, gladly approve of that increase on behalf of him and his family.

Mr. Loveday seconded the resolution, and it was unanimously agreed to.

A vote of thanks to the chairman was then proposed by Mr. Loveday, seconded by Mr. Oakes, and unanimously carried.

The Chairman briefly expressed his thanks for the vote, and the proceedings terminated.

GREAT NORTHERN TELEGRAPH COMPANY OF COPENHAGEN.

Abridged report of the annual general meeting held at Copenhagen on the 15th April, 1882, H. C. Shaw, Esq., presiding.

The chairman, C. F. Tietgen, Esq., opened his address by remarking that the past year had undoubtedly been the most significant of those ten years during which the company as now constituted had existed. This not only referred to the extraordinary progress which the telegraph had made in China, but also to the prosperous state of the company's general business. He then reported as follows:—As in former years, the cables had not been free from interruptions. In the far East these had not occurred as often in the first half of the year as in the latter half, when they had unfortunately been more frequent and of longer duration. The Shanghai-Amoy-Hong-Kong cables had been interrupted for 14 days, the Shanghai-Nagasaki cable for four days, and the Nagasaki-Wladiwostock cable, to which cable nothing had happened since the beginning of 1878, had been interrupted from the 1st November to the 7th December, and again from the 30th December to the 23rd January this year. In Europe the cables had also on several occasions been broken, as well in the North Sea as in the Baltic, but generally the repairs had been effected very speedily. Some of these breaks, happening at the time of the violent gales last autumn, when the cables of other companies also suffered severely, were no doubt attributable to causes beyond human control; but most of the other cases could be traced to carelessness in anchoring and to trawl fishing, and he had therefore much pleasure in adverting to the question of protection of cables—a question which it had often been desired to bring to an issue. The time had fortunately arrived for this. At the Fishery Conference held at the Hague last summer, the Danish representative, acting upon instructions received from his Government, brought the matter before the Congress, and it was unanimously agreed that the different governments should be recommended to follow it up. Since then this company had, in conjunction with all the other cable companies, applied to the English Government, who readily promised to take the matter into consideration. The same had been the case with other governments, amongst others, the French, who had now proposed that a congress should meet for the sole object of considering this important question. The company fully expected that good results would arise from such eventual legislation, but, nevertheless, the directors must continue to keep up the efficient state of their two repairing steamers, which have done good service during last year. The new steamer, the *Store Nordiske*, had left for China with a full cargo of cable, part being for the company's own use, part for the completion of the Russian Saghalin contract. Next, in the month of September, this ship had laid a cable for Chinese account across the Yangtsekiang, near Chinkiang, and she has subsequently been employed in effecting the different repairs which became necessary in the Chinese waters. On the arrival of the *Store Nordiske* in China, the *H. C. Ørsted* returned to Europe with a cargo of tea, and finally arrived in Copenhagen in November. Shortly afterwards she had been chartered for repairs to be effected near Bilbao, for account of the Direct Spanish Telegraph Company, which work had been very successfully done. Owing to the interruptions of the cables in the far East, the extra-European traffic had suffered. Not so the European traffic, as the interruptions did not affect the regular business, owing to the company's many duplications, and on the whole it would be found that the receipts were about the same as those of the previous year. The most important event of the year had been the development of telegraphy in China. The construction of the

extensive land line between Shanghai and Tientsin, which the company had referred to in last year's report, had been commenced on the 16th June, and completed on the 28th November. The line had been erected by two columns of engineers and workmen, one column working from Tientsin south towards Shanghai, the other from Shanghai north towards Tientsin, and meeting half ways. The first telegrams were exchanged on the 29th November, after which the Chinese Government, in order to accustom the public to the telegraph, carried their messages free of charge for a month. Eight employés of the company had been engaged for the Chinese service in the different stations, of which the most important were Shanghai, Soochow, Chinkiang, and Tientsin. The line consisted of two wires, of which one was reserved exclusively for the through traffic between Shanghai and Tientsin, whereas the other was used for the local traffic of the other stations. This great artery for the telegraphic correspondence in the north of China had already been extended by the establishment of a line from Chinkiang to Nankin, the old capital of the Chinese Empire. This line would probably be extended along the Yangtsekiang to Hankow, the largest and most important commercial town of Central China. In the south of China, the introduction of telegraphs would also commence by the establishment of a line from the most important southern town, Canton, to the flourishing British colony, Hong-Kong. The company had, on the 25th March, signed a contract for the supply of all the materials required, and for the supervision of the erection of the line, the length of which is about 100 English miles. When the line is completed and ready for the opening of traffic, some of the company's staff will be engaged for the traffic service. If the company had thus succeeded in taking such an active part in the development of the telegraph in China, it had mainly been owing to the confidence in the company shown by the Chinese Government, and notably by Li-Hung-Chang, the Viceroy of Tientsin. This eminent statesman, who has added to his other dignities that of an appointment as Imperial Commissioner of Telegraphs for the whole of the Empire, had, under date of the 8th June, 1881, granted the company a concession giving them a perpetual monopoly for the existing cables in China belonging to the company, and another concession by which the company had obtained a guarantee that no other company or person will be allowed for the next twenty years to land cables in any part of China. During this same period of twenty years the Chinese Government had further undertaken that neither would they themselves, nor would they allow other parties to establish land lines in China which might compete with the company's cables. Finally, the Government had given the company the preference in the competition for any contracts which they might wish to make for the construction of telegraph lines of their own. The chairman said that he could not finish this part of his remarks with reference to the company's business in China during the past year without saying that the great results obtained were principally owing to the labours of the managing director, Captain E. Suenson, and to the manner in which he had conducted these negotiations, but great thanks were also due to the company's leading officers in China for the ability shown on this occasion; and in fact all members of the company's staff engaged in this business had done their best to further the interests of the company. The directors did not therefore hesitate to propose that the company's contribution to the pension fund of the staff should for the past year be increased to Kr. 20,000 (£1,111 2s. 3d.), about the double of previous years. Finally, the chairman remarked that he regretted to find that the advantages gained in China by the company had given rise to a certain feeling of dissatisfaction and jealousy amongst persons of other nationalities residing in China, and that even diplomatic assistance was said to have been obtained in order to oppose the company's interests. Hitherto the latter had been without avail, and no doubt the antagonistic feelings would disappear as soon as it became evident that the privileges accorded to the company resulted in advantages to the opponents themselves, and to the world at large. The company had also had their attention fixed upon the advantage of the introduction of the telephone in China, and had therefore made arrangements with the Oriental Telephone Company, limited, jointly to carry on this business. Telephone exchanges were now already established in Shanghai and Hong-Kong. In referring to general topics, the chairman first of all referred to the great loss the company had sustained by the death of Mr. H. J. Pallisen, of St. Petersburg. Mr. Pallisen had been intimately connected with the company since its formation, and had always, as its representative in Russia, taken the greatest interest in all its undertakings. He would be succeeded by Captain W. de Hedemann, who had hitherto transacted agency business for the company at St. Petersburg. The successors of Mr. Pallisen's firm would continue to be the company's bankers. The company had acquired new and more suitable premises for its stations at Libau, Nystad, and Shanghai. With regard to the latter it might be mentioned that they are situated in a very convenient and central position, and that the Chinese Government station is located in the same. The company's instrument workshops at Copenhagen had been largely extended, and could now favourably compare with the best foreign establishments. Reverting to the accounts, the Chairman referred to the balance sheet, and showed that the result of this year's working was that after £55,555 11s. 1d. had been added to the reserve fund—which fund now, after the outgoings of the past year, would stand at £210,151 7s. 10d.—and after 7½ per cent. had been paid to the shareholders, a cash balance of £19,688 18s. 7d. would be carried forward to next account.

Without discussion, the report was then unanimously adopted, the accounts were passed, and discharge given to the board of directors. The retiring director, Moritz G. Melchior, Esq., was re-elected. The shareholders' auditors, his Excellency Admiral Bille, and A. Berner, Esq., were also re-elected. A shareholder proposed a vote of thanks to the board of directors generally, but especially to the chairman (C. F. Tietgen, Esq.), and to the managing director (Captain E. Suenson), for the great ability shown in the management of the company's business. The resolution being put to the meeting, was heartily responded to.

THE WEST INDIA AND PANAMA TELEGRAPH COMPANY, LIMITED.—At a meeting of the board of this company, held on the 20th instant, it was resolved to recommend to the shareholders, at the approaching general meeting, the declaration of a dividend of 6s. per share, on account of arrears of dividend on the first preference shares to 31st December, 1881, carrying £2,294 13s. 1d. to the current half-year.

THE TELEGRAPH CONSTRUCTION AND MAINTENANCE COMPANY, LIMITED.—This company gives notice that the 14th distribution on the certificates of the Second Bonus Trust, issued under the trust deed of the 12th of March, 1875, will be made on and after the 1st of May, 1882. The distribution, which arises from dividends on the shares held by the trustees, will be at the rate of 11d. per £5 certificate, payable two clear days after presentation of coupon No. 14 at Messrs. Barclay, Bevan & Co.'s bank. And also that all certificate-holders who have not received the return of capital at the rate of £2 10s. per £5 certificate declared in August last, can obtain payment on lodging the certificates at the above-named bank. Notice is also given that further supplementary sheets, containing six coupons (numbered from 13 to 18), may be obtained by such certificate-holders as have not already had them, upon production of their certificates at the offices of the Company.

THE EASTERN TELEGRAPH COMPANY, LIMITED.—This company notifies that the cable between Zanzibar and Mozambique, recently broken, being now repaired, messages for South Africa can now be accepted as usual.

LATEST QUOTATIONS.

Authorised Issue.	Share.	Name.	Paid.	Closing Quotations. April 26.	Business Done.
		ELECTRIC LIGHT.			
40,000	10	Anglo-American Brush Co.	4	11⅜- 12½	12 m.
		Do. Do.	10	28 - 29	28⅜m.28¾.29
150,000	1	Electric Light and Power Generator Co.	1	⅝- ¾	¾ m.
		TELEGRAPHS.			
2,116,400*l.*	Stk.	Anglo-American, Limited	100	54 - 54½	
2,441,800*l.*	Stk.	Do. Preferred } Def'd. receiving no div. until }	100	84½- 85½	
2,441,800*l.*	Stk.	Do. Deferred } 6 p. c. has been paid to Pref. }	100	24½- 25	24⅝ m.
130,000	10	Brazilian Submarine, Limited	10	10⅝- 11¼	
16,000	10	Cuba, Limited	10	8½- 9	8⅝ m.
6,000	10	Do. 10 per cent. Preference	10	15½- 16½	
13,000	10	Direct Spanish, Limited	9	6 - 6¼	
6,000	10	Do. 10 per cent. Preference	10	15 16	
65,000	20	Direct United States Cable, Limited, 1877	20	11⅜- 11⅞	11⅜ ac.
100,000*l.*	100	Do. 6 per cent. Debenture, repayable 1884	100	100 -103	
380,000	10	Eastern, Limited	10	10 - 10¼	10 3/16-¼ m.
70,000	10	Do. 6 per cent. Preference	10	12½- 13	12 7/16 m.
232,000*l.*	100	Do. 6 do. Debentures, repayable Oct. 1883	100	99 -102	
200,000*l.*	100	Do. 5 do. do. Aug. 1887	100	101 -104	
200,030*l.*	100	Do. 5 do. do. Aug. 1899	100	102 -107	
199,750	10	Eastern Extension, Australasia & China, Limited	10	11⅛- 11⅞	11⅜ m.
320,000	100	Do. 6 p. c. Debentures, repayable Feb. 1891	100	106 -110	
500,000	100	Do. 5 p. c. (Australian Gov. Subsidy) Deb. 1900	100	103 -106	
140,000	100	Do. do. registered, repayable 1900	100	103 -106	
100,000*l.*	100	Do. 5 per cent. Debenture, 1890	100	103 -106	
254,300*l.*	100	Eastern and South African Limited 5 per cent. } Mort. Deb. Registered redeemable 1 Jan. 1900 }	100	103 -106	
345,700*l.*	100	Do. do. do. To Bearer	100	103 -106	
22,050	10	German Union Telegraph and Trust, Limited	10	9⅜- 10⅛	
163,390	10	Globe Telegraph and Trust, Limited	10	6¼- 6⅜	6 7/16 m.
163,209	10	Do. 6 per cent. Preference	10	12⅛- 12⅜	12⅛-¼ m.
125,000	10	Great Northern	10	12⅛- 13⅛	
100,000*l.*	100	Do. 5 per cent. Debentures	100	102 -105	
31,200	10	India-Rubber, Gutta-Percha and Telegraph Works	10	24½- 25½	25.4¼m.24¾ac
100,000	100	Do. 6 per cent. Debentures, 1886	100	101 -105	
17,000	25	Indo-European, Limited	25	30 - 31	30½ ac.
38,148	10	London Platino-Brazilian, Limited	10	4¼- 5¼	
12,060	10	Mediterranean Extension, Limited	10	2 - 2¼	
8,200	10	Do. 8 per cent. Preference	10	8¾- 9¼	
9,000	8	Reuter's, Limited	8	13½- 13⅞	
280,000	Stk.	Submarine	100	260 -270	
58,225	1	Do. Scrip	1	2¼- 2⅜	
4,200	Cert.	Submarine Cables Trust	100	103 -106	
37,350	12	Telegraph Construction and Maintenance	12	30 - 31	30½ m.
150,000	100	Do. 6 per cent. Bonds, 1884	100	102 -105	
186,750	5	Do. 2nd Bonus Trust Cert.	5	1⅛- 1⅜	1 1/16 m.
30,000	10	West Coast of America, Limited	10	5 - 5⅛	
150,000	100	Do. 8 per cent. Debentures			
69,910	20	Western and Brazilian, Limited	20	8 - 8⅛	
200,000*l.*	100	Do. 6 per cent. Debentures "A" 1910	100	105 -110	
2,500	100	Do. 6 p.c. Mort. Deb. series B of '80, red. Feb., 1910	100	98 -101	
1,500	$1,000	Western Union of U. S. 7 p.c.1 Mort.(Building)Bds.	$1,000	124 -129	
1,030,000*l.*	100	Do. 6 per cent. Sterling Bonds	100	102 -105	
88,321	10	West India and Panama, Limited	10	1⅝- 2	
34,563	10	Do. 6 per cent. 1st Preference	10	8⅜- 9	8⅝ m.
4,669	10	Do. 6 do. 2nd do.	10	6¼- 7¼	
		TELEPHONES.			
154,165	1	Con. Telephone & Maintenance, Ld. Nos. 1 to 154,165	1	1⅝- 1⅞	1 9/16-½
200,000	1	Oriental Telephone Co.		⅛- ¼	
100,000	5	United Telephone Co.	5	13½- 13⅝	

TRAFFIC RECEIPTS.

The Cuba Submarine Telegraph Company, Limited. The number of messages passing over the lines of this company during the month of March was 4,300, estimated to produce £4,000, against 3,207 messages, producing £3,124, in the corresponding month of last year. The traffic receipts for the month of January, estimated at £2,800, realised £3,021.

The Western and Brazilian Telegraph Company, Limited. The traffic receipts for the week ending April 14th, 1882, were £1,903, after deducting the "fifth" of the gross receipts payable to the London Platino-Brazilian Telegraph Company, Limited.

The West India and Panama Telegraph Company, Limited. The estimated traffic receipts of this company for the half month ended the 15th April are £3,739, as compared with £2,640 in the corresponding period of 1881.